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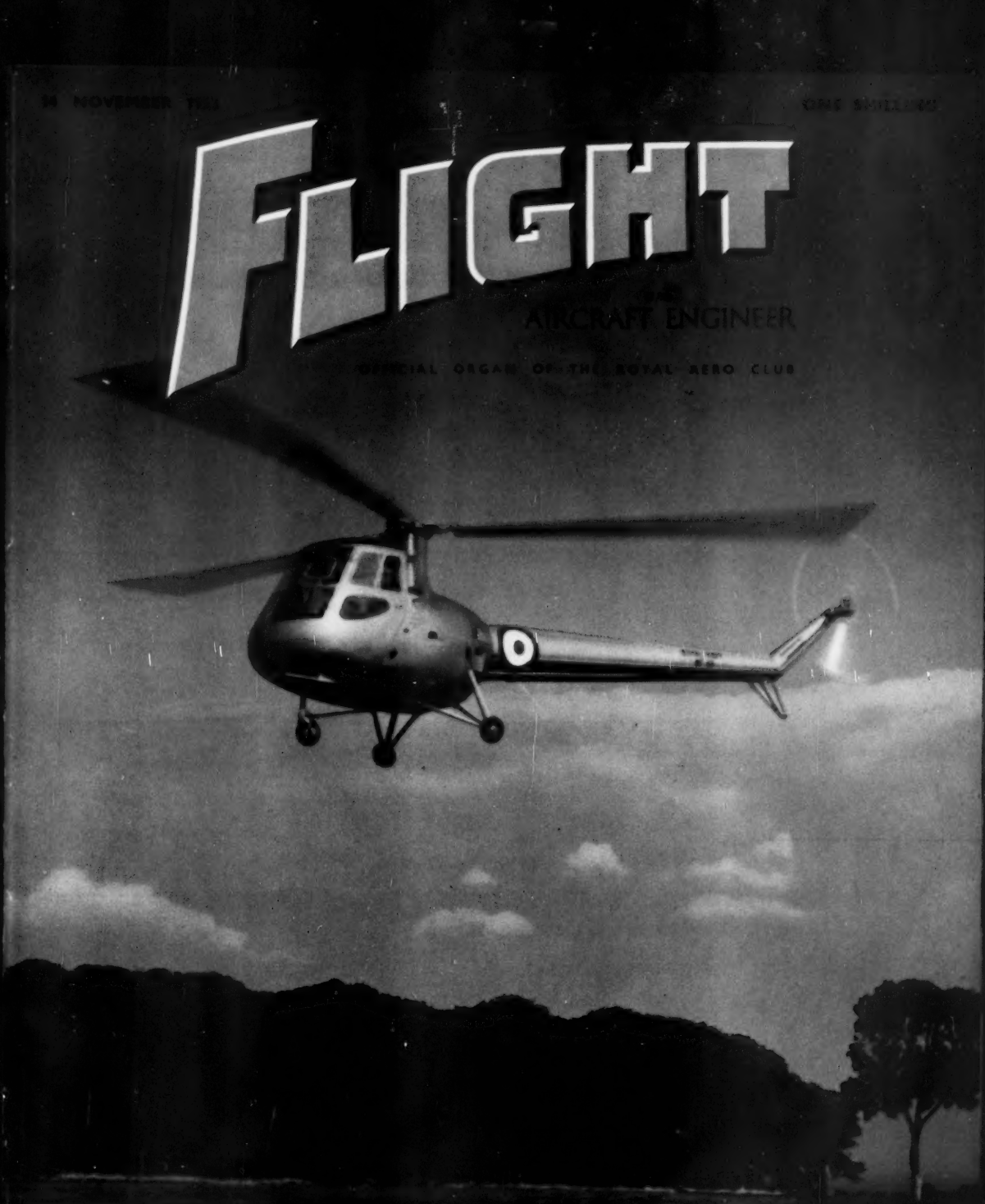

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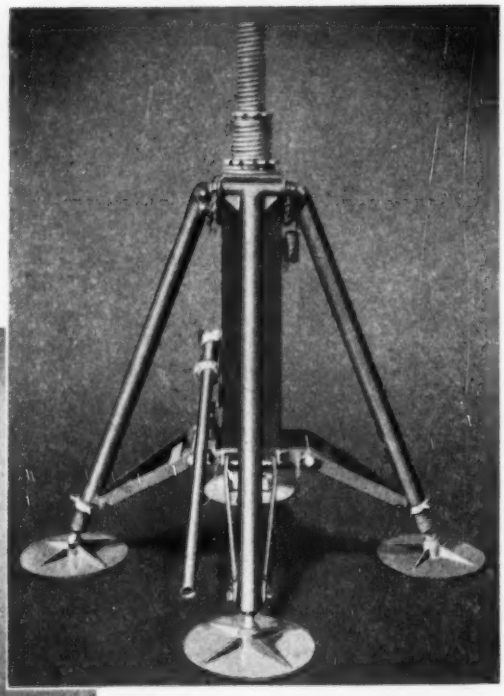

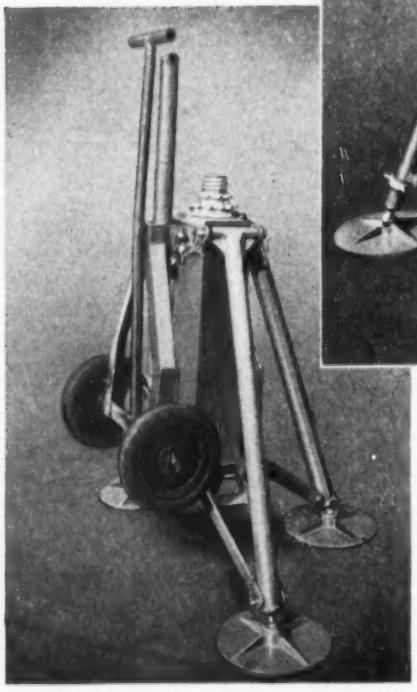

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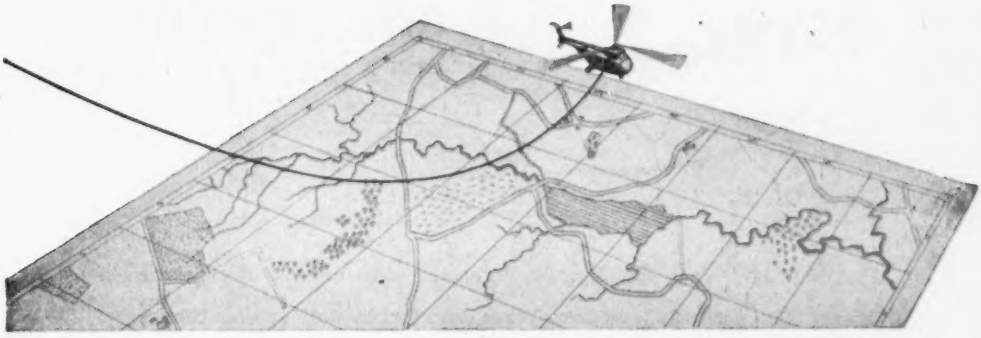

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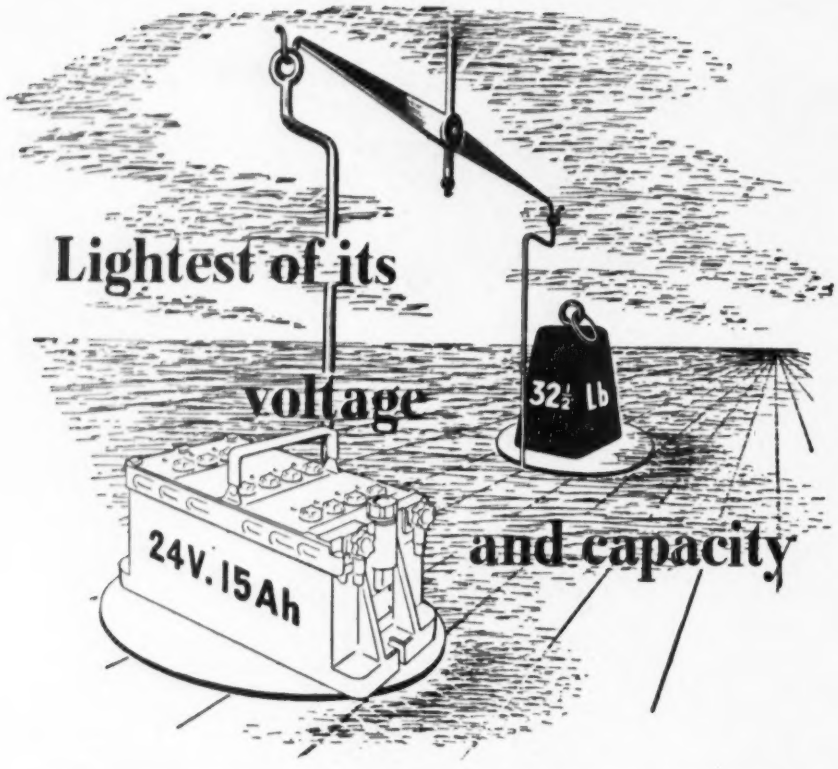

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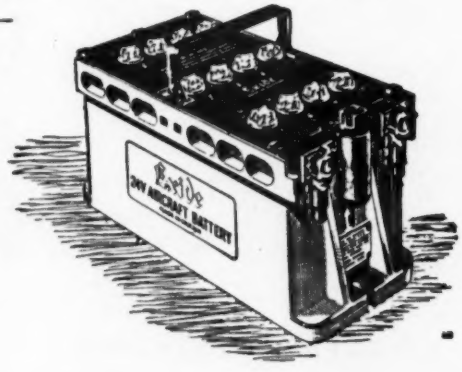

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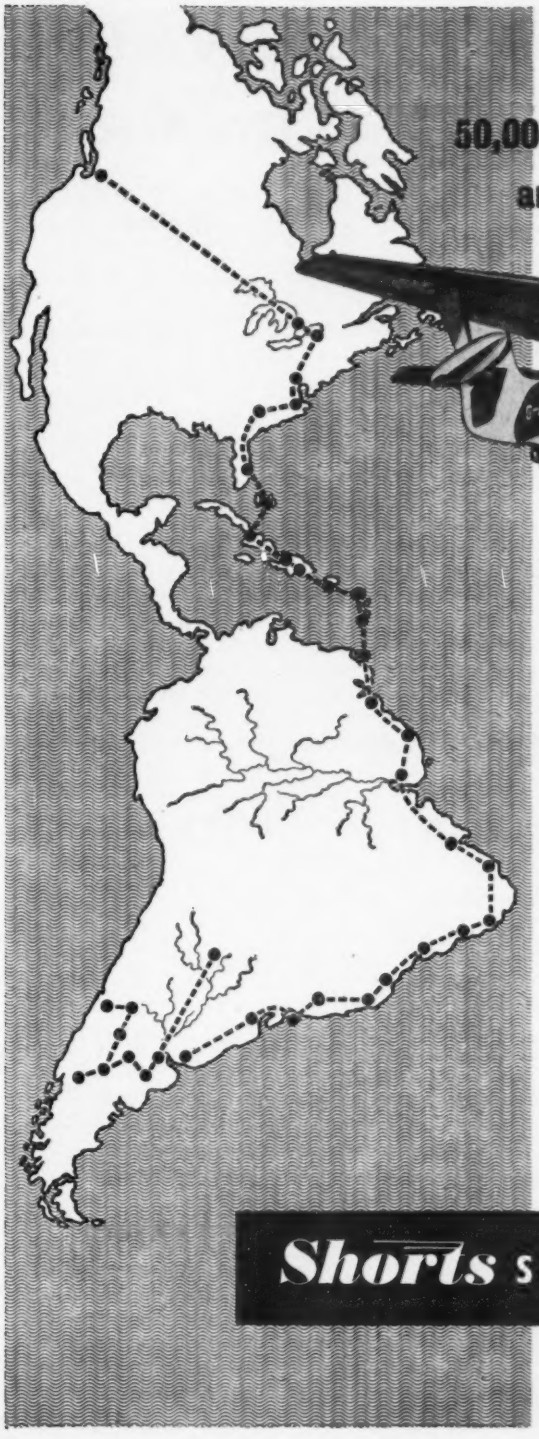

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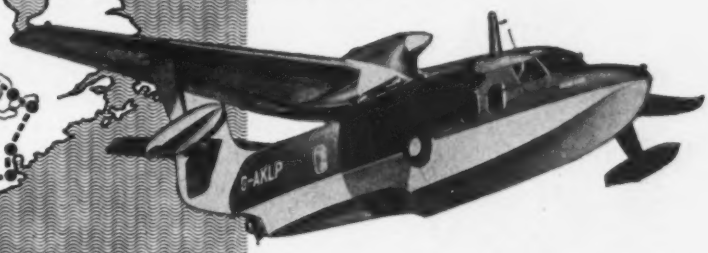

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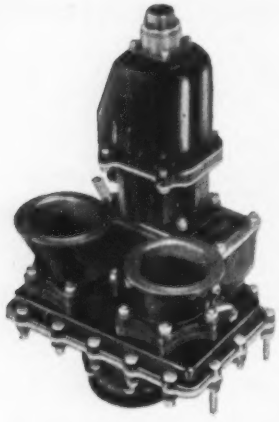

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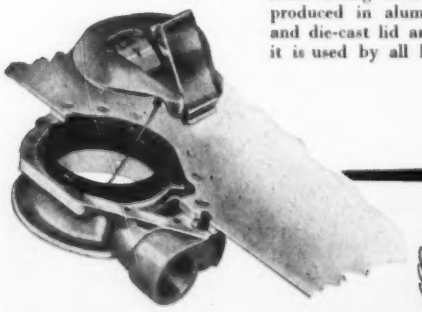

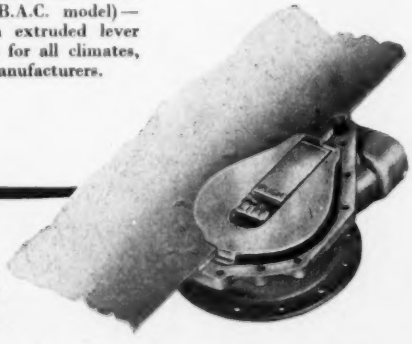

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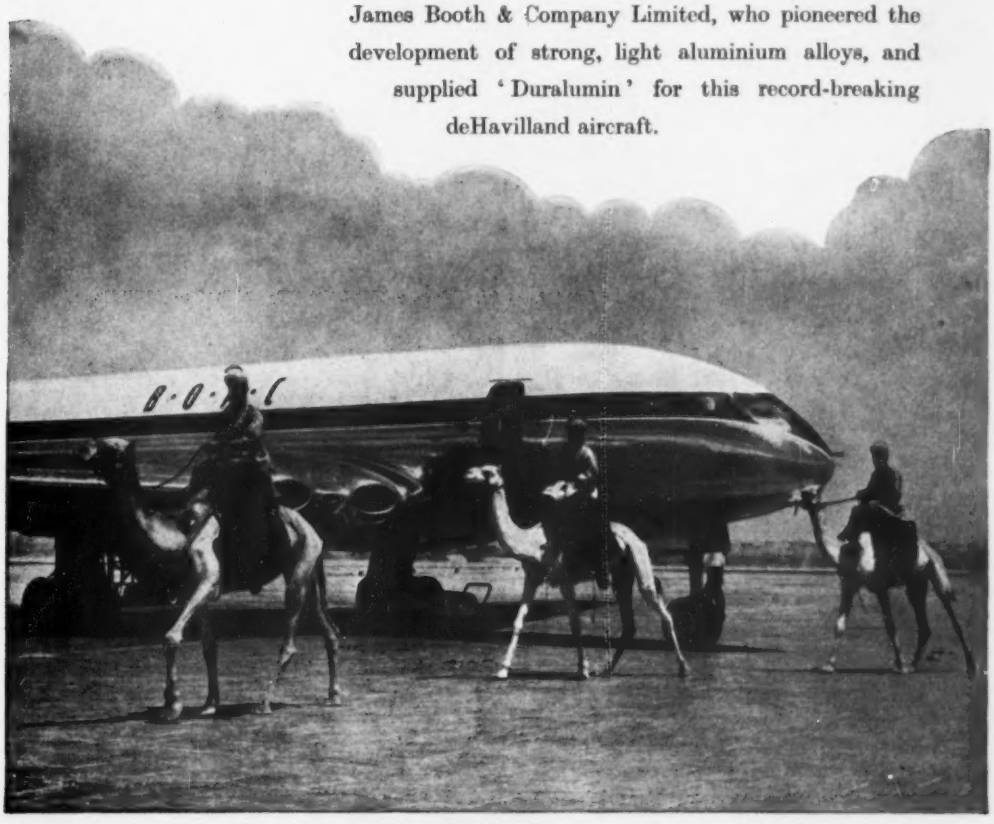

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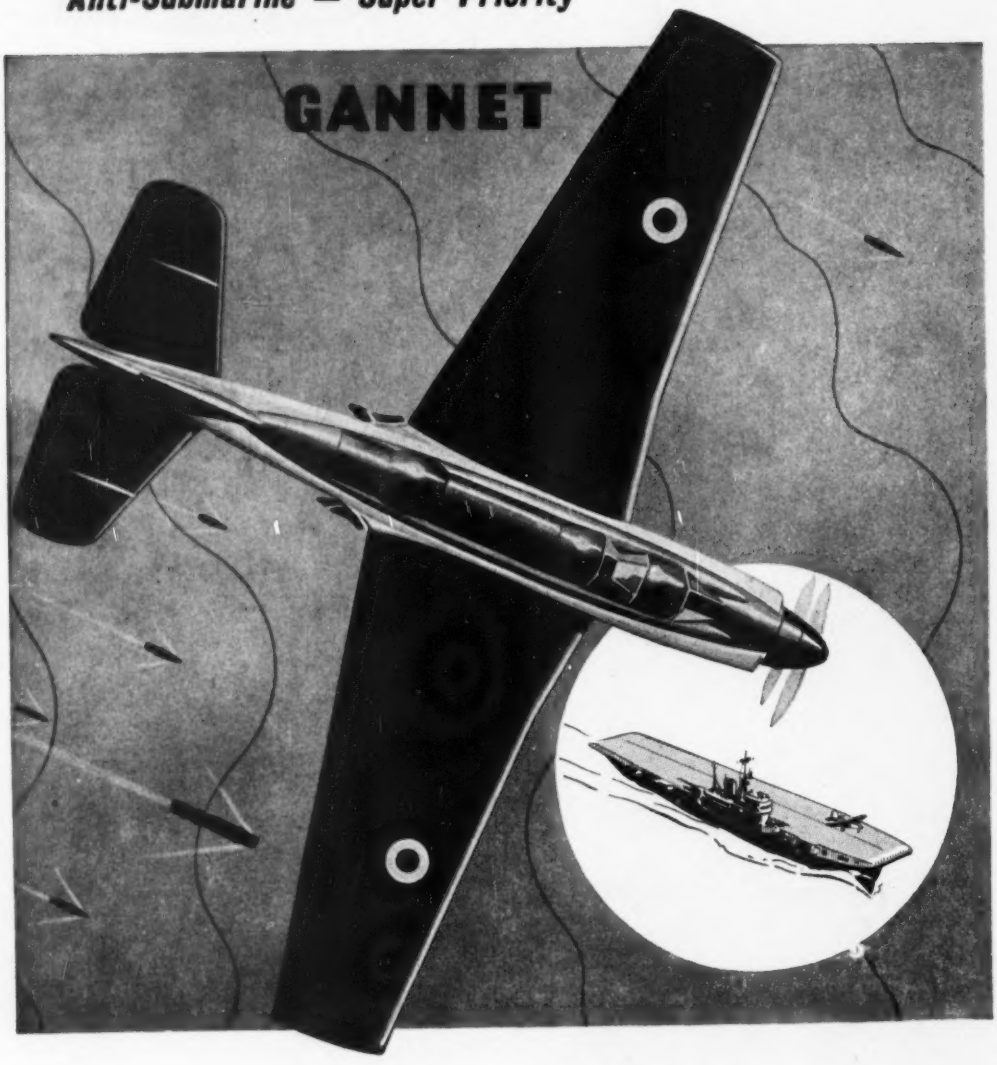

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Founded 1909

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EDITOR
MAURICE A. SMITH, D.F.C.

ASSISTANT EDITOR
H. F. KING, M.B.E.

ART EDITOR
JOHN YOXALL

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Hushing the Helicopter

EIGHTEEN months ago we called for a realistic approach to the problem of aircraft noise—the exterior noise, more particularly from the engine—and we treated rotorplanes as one special case. Subsequently, when discussing the matter with engineers and operators, we have been a little disconcerted to find that for the most part, far from having given consideration to solving the problem, few of them realized—or at any rate were prepared to admit—that the problem existed. One or two of the designers not unnaturally passed the buck by remarking that, until the operators wrote-in a requirement, they had no call to add silencers to helicopters. With the desire to avoid more accessories and reduce the somewhat marginal payload of the present small helicopter we can sympathize, but not with the ostrich-like attitude. On commercial helicopters the cost and weight of silencing should be faced; soon it will have to be.

Rotating-wing aircraft have really come into their own for military roles in Korea (even America has no rotorplane airline as yet). What is the attitude towards noise under war conditions? Opinions from ground observers in Korea are hardly to be expected, but we may quote again one anonymous statement, based on airborne experience, which is by no means irrevelant. It seems that troops taken into battle in helicopters ". . . have settled down to the fight at once because they are both pre-deafened and inured to vibration."

In his lecture last week (summarized on pages 620-623) Mr. Peter Masefield stated that "for some reason as a people we, the British, seem to be particularly susceptible to, or specially intolerant of, noise from the air . . ." Later he said that if the noise problem could not be solved—or diverted—we should have to think again about the transport helicopter. He added that the maximum amount of silencing tolerable from the payload point of view must come from detail design of the aircraft. In the discussion which followed, Dr. Hislop, head of B.E.A.'s Helicopter Group (who had a good deal to do with noise-measurement during the trials of the Westland S.51 and Bristol 171 helicopters from the Waterloo Site), implied that the noise problem was being over-rated. On the other hand, Mr. Briscoe of the Ministry of Civil Aviation said that there was official concern about noise.

Mr. Lennox-Boyd, Minister of Transport and Civil Aviation, in the course of the recent Civil Aviation Debate in the House, was more forthright. He said ". . . helicopters might well be the complete answer to the problem of transport between cities if only the *frightful* noise-factor could be overcome." Our comment at this stage might well be "Hooray!" for our first purpose has been to help to bring about the recognition that aircraft noise in and over cities does constitute a problem, this being the first essential step towards getting something done about it. The task of incorporating engine-silencing equipment in new helicopters at the design or early-development stage would be as nothing compared with that of modifying existing fixed-wing transports (with their clean, close-cowled power units) to incorporate silencers.

We wish that Mr. Hafner had expressed an opinion about noise when he, too, took part in the discussion after Mr. Masefield's lecture, for his Bristol 173 may be the first helicopter to operate over London and other cities. Presumably it is about twice as noisy as the 171 (which has been described by one authority as acceptable) having two engines, whence most of the noise comes. The Bristol Aeroplane company are apparently noise-conscious, for even if they did not intentionally build exterior quietness into their magnificent Britannia and its Proteus turboprops, they lost no time in extolling this virtue when it became a principal topic at Farnborough time.

According to reports, the sound of a ramjet helicopter—one with small units at the blade-tips—is nothing short of shattering, and this alone may preclude the fitting of this type of power to commercial helicopters. Fortunately, gas turbines appear to be a more likely power source, and the indications are that in this application they will be relatively quiet. It is our hope that the helicopter will not come to be regarded as one more jarring noise thrust upon the long-suffering British public, but rather that it will be a welcome and unobtrusive as well as convenient new means of transportation.

AFRICAN AIR SURVEY

Big Colonial-development Mapping Programme Completed

THE return to Britain of No. 82 Squadron, Bomber Command, at the completion of their six-year task in Africa, brings to an end one of the biggest air mapping programmes ever attempted in peace-time. The arrival at Benson of the last Lancaster—piloted by W/C. S. G. Wise, C.B.E., D.F.C., the C.O. of No. 82 Squadron—on Friday October 31st., was reported in our issue of November 8th.

The project for the extensive aerial surveying of large areas of British Africa was first discussed in 1943, when the Colonial Research Committee agreed to the Colonial Survey and Geophysical Committee drawing up a scheme to undertake geodetic surveys and topographical mapping of Africa at the end of the war. Early in 1946, at the then newly opened headquarters of the Directorate of Colonial Surveys at Teddington, Middlesex, it was decided that the survey unit should be drawn from the photographic-reconnaissance strength of the R.A.F. Apart from the extensive aircrew training a survey of this nature would provide it was felt that the R.A.F. was best equipped for the long-distance flights such a programme entailed. It was also considered that the deployment of flying detachments could more easily be provided for by the R.A.F., which already had available radar equipment and airfields adjacent to the areas included in the project.

It was with this background that, in March 1946, a flight of No. 541 Squadron was sent to Accra, on the Gold Coast, to begin photographic operations over an area covering 145,000 square miles of Gambia, Nigeria, Gold Coast and Sierre Leone. This initial attempt was, however, dogged by bad weather and the unit returned to Britain a year later to re-organize and become the nucleus of No. 82 Squadron. In April and May of 1947, as a complete unit, No. 82 Squadron moved to R.A.F. Station Eastleigh, near Nairobi in Kenya, which became the principal base for the whole survey operations.

The squadron consisted of approximately 310 officers and airmen with seven Avro Lancasters Mk 1 (P.R.) for photography, and two Dakotas for passenger and freight carrying and supply-dropping to the parties manning remote radar-beacon sites. When it first went to Africa, No 82 was commanded by W/C. R. J. Abrahams, O.B.E. (now Wing Commander Admin. at Benson), who later handed over to W/C. Torrens, O.B.E. W/C. Wise has had command of the unit since July of last year.

The programme was very varied. Topographical maps were needed for colonial development schemes—including the ill-starred ground-nut and poultry schemes—and the ground covering a railway link between East and Central Africa had to be mapped. In addition there were irrigation projects in Basutoland, hydro-electric undertakings in Rhodesia and West Africa, and international boundaries and agricultural and mineral developments in other parts of the continent. Some of these areas were over 3,000 miles distant from the Eastleigh base, and, although the two

82 SQUADRON R.A.F
PHOTOGRAPHIC SURVEY OPERATIONS
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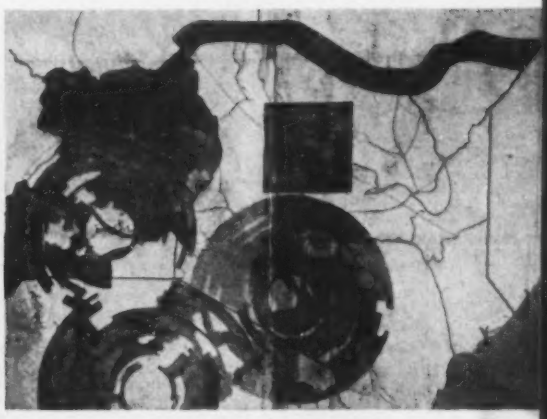


(Left) Welcome home: Air Chief Marshal Sir Hugh P. Lloyd, A.O.C-in-C. Bomber Command, was present at Benson for the arrival of the last Lancaster. He is talking to the captain, W/C. Wise. (Right) A map in the flight-planning room at Benson gives an impression of the large areas covered.

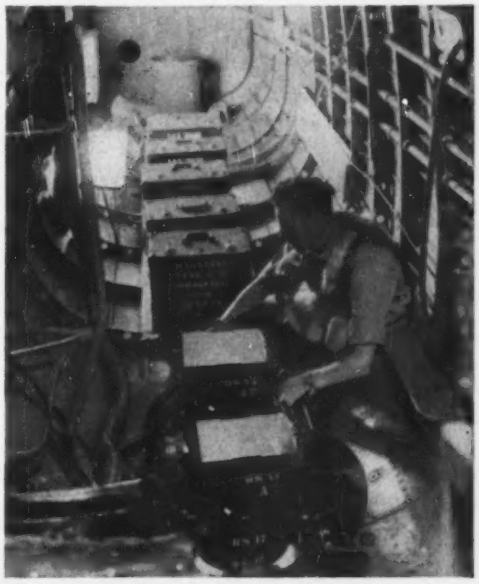
course and plus or minus 200ft in height, it can be realized how difficult and fatiguing was the task performed by the aircrews generally.

Because of this mode of operation over circular tracks, it was found impossible to work closer than 30 miles to the radar beacon and, through erratic reception, unsatisfactory at distances much greater than 200 miles. Even the most expert aircrews failed to get perfect coverage and filling in the gaps was the most difficult job of all. Frequently, of course, these gaps were caused by cloud conditions co-incident with the inter-tropical front which moves up and down the African continent from April to October. The best photographic weather is experienced round about Christmas.

The P.R. Lancasters had a normal range of 2,300 miles and a maximum range of 2,900 miles, with a cruising speed of 200 knots. Photographic ceiling at 23,000ft was a handicap in mountainous country, for it was impossible to get the required 15,000ft over some of the peaks in order to take the photographs at the pre-determined scale of 1 : 30,000.

Originally the squadron used the American-built K.17 cameras but in August 1951 a change was made to the F.49 type; this is the R.A.F. designation for the Williamson Eagle IX. The improvement in photographic quality was most noticeable. This was probably due to two reasons: an improved optical system and the pressure-plate system of holding the film in perfect register with the focal plane.

In the year 1946-47 only 34,200 square miles were surveyed, but a record figure of 255,758 square miles was reached in 1950-51. The total area covered during the whole six years of operation was 1,216,000 square miles. This involved an average of 8,000 negatives taken and processed each month and the operating of 44 separate radar beacons. The average number of exposures from each sortie was 300 but on at least one occasion this figure was increased to 1,000. In time, a sortie usually lasted between five and ten hours but some coverages meant a round trip of 1,200 miles, not including the actual flying for photography.



Two K.17 cameras and spare magazines of film installed in an 82 Sqn. Lancaster. From August, 1951, the Williamson F.49 replaced the K.17.

Royal Engineers personnel setting up a series of overlap photographs from a sortie. The curved flight-path is apparent.

During this long period of continuous flying, much of it over extensive jungle and desert areas, there was no serious casualty from any cause and only one Lancaster sustained any damage.

No. 82 Squadron was first formed at Doncaster in 1917, and went in the same year to France, where its rôle was chiefly artillery co-operation. Disbanded in 1919, it was reformed at Andover in 1937 as a fighter-bomber squadron. No. 82 fought through the Battle of France and in the Battle of Britain it undertook day bombing of invasion ports.

It was while it was operating in the Battle of Britain that the squadron first came into contact with its present A.O.C-in-C.—Air Chief Marshal Sir Hugh P. Lloyd, who was then Senior Air Staff Officer at No. 2 Group. Later—in 1941-42, when Sir Hugh was A.O.C. Mediterranean, at Malta—the squadron again operated under his command, on shipping strikes and convoy protection.

FROM ALL QUARTERS

The Goodwill Mission

AS the four Canberras of No. 12 Squadron R.A.F. go from country to country in South America, public interest and enthusiasm continues at an even greater pitch. They reached Bogota, Colombia, on November 7th, after covering the 1,245 miles from Lima, Peru, in about two-and-a-half hours.

After their arrival at Bogota's Techo Airport—which lies at 8,400ft above sea level—they flew over the district in company with the two Hastings Transports which are servicing the flight. On the following day the leader of the mission, A.V-M. D. A. Boyle, demonstrated one of the Canberras over the city, the main streets and squares of which quickly became packed with dense crowds of excited spectators.

The mission left on Monday for the Carribean countries and Mexico.

Queen Mother at Finsbury Barracks

ON Monday evening last, Queen Elizabeth the Queen Mother visited No. 2600 (City of London) Light Anti-Aircraft Squadron, R.Aux.A.F. Regiment at the unit's town headquarters, Finsbury Barracks, which it shares with No. 600 (City of London) Squadron R.Aux.A.F. Her Majesty, who was received by A.V-M. W. J. Seward, A.O.C. No. 61(E) Group, Home Command, presented the Hawker Siddeley Trophy to the best gun detachment.

The Queen Mother is the Honorary Air Commodore of No. 2600 Squadron, which is commanded by S/L. A. G. Collings. For the dual inspection of Nos. 600 and 615 Squadrons by the Queen Mother and Mr. Winston Churchill at Biggin Hill recently, No. 2600 Squadron provided the Guard of Honour.

Gannet Flies on Diesel Fuel

THAT the Armstrong Siddeley Double Mamba turboprop is able to run on ship's diesel fuel has long been public knowledge; what *is* news is that a Fairey Gannet carrier-borne anti-submarine prototype has actually been airborne with this fuel in use. The fuel concerned is 47 cetane, used in the Royal Navy for all diesel-powered generating plant and other auxiliary engines in aircraft carriers. No modifications are necessary to the Double Mamba.

A published statement that the Gannet's flight was the first occasion on which a Service aircraft had used diesel oil is by no means correct. Many readers will recall the Hawker Horsley, which flew with a compression-ignition Rolls-Royce Condor; the Westland Wapiti, powered with a Bristol Phœnix, which, in May, 1934, achieved a height of 28,000ft under officially observed conditions; and the Blackburn Iris, used for development flying with three Napier Culverins.

Monte Bello Echoes

SOME hitherto unreported aspects of the Monte Bello atomic-bomb test were revealed by Dr. W. G. Penney of the Ministry of Supply in his world-wide broadcast talk on November 7th. Dr. Penney—who modestly introduced himself as "a scientist who took part in the trial"—described the scene as he saw it from the flight-deck of the aircraft carrier *Campania*. "We all faced away from the explosion as the last few seconds were counted over the loudspeakers," he said. "Suddenly there was an intense flash, visible all round the horizon. We turned round to look. The sight before our eyes was terrifying—a great, greyish black cloud being hurled thousands of feet into the air and increasing in size with astonishing rapidity. A great sandstorm suddenly sprang up over the islands. It seemed ages before we heard the bang but, in fact, it was only a minute. Somewhat to our surprise, a second bang—at least as loud as the first—followed a few seconds later. At the same time we felt a peculiar sensation in our ears such as one has in an aircraft losing height rapidly. We were feeling the suction, or reduced pressure, which always follows a blast wave . . .

"The explanation of the two bangs heard on the ships and also heard on the mainland is actually quite simple. The first bang was the direct sound-wave, and the second was a reflection from a layer of warm air some two miles up."

Speaking of the recording instruments used—they included some 300 electronic devices of various types—Dr. Penney said that a special problem arose in regard to obtaining ultra-rapid photographs of the earliest stages of the explosion, when the "fire-ball" began to burst through the hull of the frigate in which the bomb was exploded. There was no camera on the market which would run at a high enough speed to give a slow-motion film of the kind required; so the expedition designed and built its own. "We ran our camera," said Dr. Penney, "in such a way that it took about a hundred pictures at intervals of 10 microseconds—that's to say, at the rate of 100,000 pictures per second. The exposure time for each picture was one ten-millionth of a second!"

SOUTH AMERICAN WAY: During the visit of the "goodwill" Canberras to Argentina, President Peron (left) presented A.V-M. Boyle (right) with a model of the Pulqui II, Argentina's Nene-powered jet fighter.

Washington Attachés Withdrawn

AS a dollar-saving economy move, the British Naval, Military and Air Attachés, and their staff, are being withdrawn from Washington. The Air Attaché is G/C. M. G. Philpott, and his staff consists of an executive officer and a Civil Servant.

The Air and Military Attachés have already returned to this country, and their duties have been temporarily handed over to the Naval Attaché; ultimately the whole of the work will be taken over by the British Joint Services Mission.

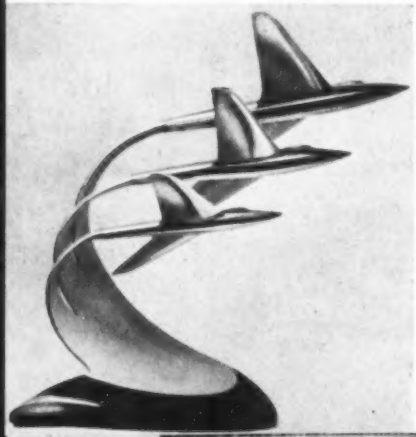
A Ministry of Defence spokesman has said that he had received no indication of similar withdrawals from other dollar countries. In all, ten British Service attachés hold appointments in such countries—all in South America.

Television Epic

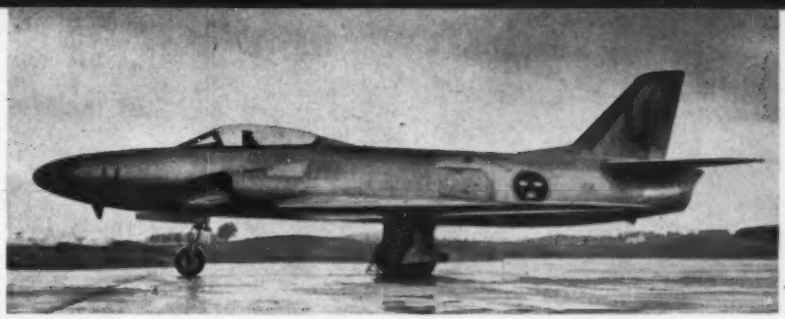
REALLY qualifying for the adjectives "colossal" and "stupendous" is an American film now being shown as a serial on the B.B.C. Television Service. Entitled *Victory at Sea*, it is a mammoth 13-hour documentary being shown in 26 weekly episodes. Its 75,000 footage was edited from 50 million feet of Allied and enemy war film and tells the poignant story of the tragedy and sorrow of the early Allied defeats, of the counter-measures taken and finally, of the Allied victory on all the seas.

Although edited for an American audience and dealing primarily with the war at sea, there are many air sequences of immense historical interest. Episode 1 began the Battle of the Atlantic, and episode 2, entitled "The Pacific Boils Over," covered the attack on Pearl Harbour.

Sequences showed the briefing of the aircrews and the bombing up of aircraft on some of the six carriers taking part in the treacherous but extremely well planned attack. The attacking force totalled 360 aircraft, made up of a mixture of Mitsubishi Zero (Zeke) fighters—the outstanding manœuvrability of which proved such an unpleasant surprise—Nakajima Kate (Navy 97) torpedo-



SIDEBOARD FORMATION: This striking trophy is being presented by A. Cdre. Whitney Straight, deputy chairman of B.O.A.C., to the Society of Model Aeronautical Engineers, as an award for model-aircraft championship racing. It is the work of Mr. P. E. Normon, of Banstead, Surrey.



SWEDEN'S LATEST: The A.32 Lansen, Saab's new Avon-powered two-seat ground-attack fighter, is the outcome of team-work between Saab engineer Arthur Brasjo and the Swedish Air Force, Air Ministry, Air Research Institute and Institute of Technology. The first photograph appeared in "Flight" last week.

bombers and Aichi Val (Navy 99) dive-bombers. Oddly enough, Douglas Dauntless dive-bombers also could be identified in the film; it seems that this particular shot must have been included by accident.

Dramatic ground shots, some never before released, showed strafed American aircraft set ablaze, hangars disintegrating amid fountains of flame and smoke and personnel mown down as they ran. Shots taken from the attacking Japanese aircraft showed the harbour installations going up in smoke, ships sinking and battleships disappearing amid gigantic explosions.

In the brief space of 110 minutes the Americans lost eight battleships, three cruisers, three destroyers and four smaller vessels; 188 aircraft were destroyed, and most of their hangars. The dead totalled 2,403. Japanese losses were only 29 aircraft, 68 aircrew, and five midget submarines.

Unquestionably ranking among the most important documentary film records of the Second World War, *Victory at Sea* is being televised in weekly half-hourly episodes (Mondays, 10 p.m.) for the next six months.

French Comets

IT is believed that Union Aéromaritime de Transports has taken up its option on two additional Comets (Avon-powered Series 2s), although official confirmation of the report is lacking. The first of three Series 1s for U.A.T. is now almost ready for flight-test at Hatfield. Air France, however, contrary to recently published reports, has not taken up its option on six Series 2s, the only firm order placed by Air France being for three Series 1 Comets.

September Exports

EXPORTS of British aircraft and parts during September totalled £3,465,799 in value—a slight drop in the monthly average (£3,484,855) as calculated over the previous twelve months.

There appear to be fair prospects of the total for the year beating that of 1951, as the annual rate, averaged from the figures for the first nine months of 1952 now stands at £42,659,232; last year's total was £41,955,652. Figures for previous years were: 1950, £34,275,423; 1949, £34,215,177; 1948, £26,004,784.

September imports, at £1,128,277, represented 32½ per cent of exports; this is higher than the average, which stood at £935,755 (27 per cent) for the previous twelve months.

Baby Turbine

A SIZEABLE order for their Mars MA-1 auxiliary gas turbine is reported by the Solar Aircraft Co., San Diego, California. Over 100 of these little units—the exact figure is unrevealed—are required for installation in Douglas C-124 Globemasters, where, using the same high-octane fuel as the four Wasp Majors, they will generate electric power during taxying and at other times when there is an insufficient supply from the main generators and/or batteries; they will also be available as a stand-by source of emergency power. The C-124 has a number of services—e.g., cargo hoists and doors—which call for a heavy current supply.

Measuring less than 18in wide by 12in high by 25in long, the Mars is at first glance almost indistinguishable from a flat-twin piston-engine of the type often used for auxiliary power supplies. It has a single-stage centrifugal compressor, only one combustion chamber, and a single-stage turbine. The complete installation, with alternator and generator, weighs 230 lb and the turbine produces some 45 s.h.p. at 40,300 r.p.m. at sea level.

Alcock and Brown Memorial

IN answer to a recent question in the Commons, Mr. Reginald Maudling, Parliamentary Secretary to the Minister for Civil Aviation, said that it had been decided to confine to aeronautical interests the appeal for subscriptions towards the memorial to Sir John Alcock and Sir Arthur Whitten-Brown. He had been informed that the sculptor, Mr. William McMillan, R.A., would shortly start work on the statue, which was to be placed at London Airport.

Brigadier Frank Medlicott (Nat. Lib., Norfolk Central) asked the Minister if he was aware that there was a widespread misunderstanding in other countries as to who were the first men to fly directly across the Atlantic and that this well-placed memorial would be a fitting tribute to one of the most heroic days in the history of aviation. Mr. Maudling said he was aware of this misunderstanding and was grateful to Brigadier Medlicott and to anyone else who would assist in dispelling it.

First Helicopter Special Number

IT will not have escaped the attention of readers that *Flight* has been devoting a considerable amount of space to helicopters. There is no doubt at all that these rotating-wing aircraft are destined to play a big part in coming years, both in the transport field and in those of agriculture and emergency operations—quite apart, of course, from the many military applications.

There are now three British companies actively engaged on rotorplane production: Bristol, Saunders-Roe (Cierva), and Westland, while Alvis are concerned with specially developed piston engines for them. The Fairey and Percival companies are also expected to announce new helicopters in the coming months. It is true to say, moreover, that every aircraft manufacturer in the British industry is interested in the type to a greater or lesser degree.

With these thoughts in mind, *Flight* began some weeks ago to prepare a special number, for publication in the New Year, to be devoted—for the first time—wholly to helicopters and their operation. The date of publication has been settled as January 23rd; several important feature articles are planned, and a review of the world's helicopters will be included.

Mr. B. A. Duncan

WE regret to learn of the death—which occurred on November 5th, after a short illness—of Mr. B. A. Duncan, O.B.E., Whit. Ex., B.Sc.(Eng), A.M.Inst.C.E., A.M.I.Mech.E., F.R.Ae.S., production director of Dowty Equipment, Ltd.

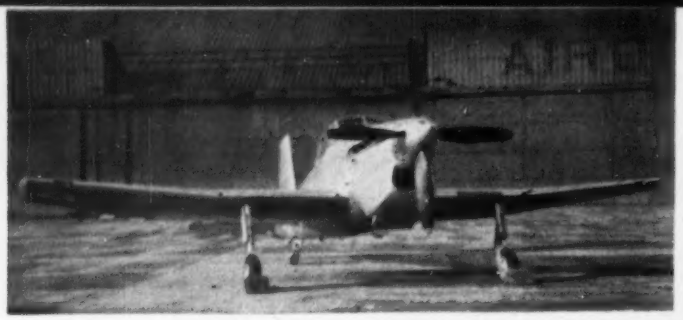
Mr. Duncan, who was 58 years of age, was well known in the aeronautical industry, of which he had long and wide experience. During the 1914-1918 war he was commissioned in the Royal Engineers and served on the Western Front, where he was wounded and subsequently—in 1918—invalided out. In 1919 he joined the Department of Aircraft Production in the Ministry of Munitions and worked on the then comparatively new problems of metal aircraft production.

During the course of his career, Mr. Duncan was successively an assistant designer at A. V. Roe and Co., Ltd., assistant designer and works manager in the experimental department of Blackburn's and manager of the experimental department at the Vickers-Armstrongs Weybridge Works. In 1942 he was appointed superintendent of Vickers' shadow factory at Chester, where he was largely responsible for the high production output of Wellingtons and Lancasters. Mr. Duncan was made an O.B.E. for services in the production of military aircraft.

Aeronautical Party

THE evening atmosphere at the Royal Aeronautical Society was uncommonly lively and informal on the occasion of the reception and dance organized by the Graduates' and Students' Section of the Society. Rooms normally used for more restrained functions shed their quietude as some 200 graduates, students, friends and guests danced in the library, refreshed themselves in committee rooms 1 and 2, and watched films in the Council Room. We were pleased by the film *Aeronautical Oddities* (referring, be it said, to aeronautical machines and not to members of the Society) no less than by the presentation of elimination-dance prizes to a *Flight*-staff colleague and his wife. Even the insidious talk concerning liquid-fuel rocket motors and the like, occasionally to be heard, did not detract too much from a very pleasant evening's enjoyment.

Guests of honour from the main Society were the President and Mrs. Dowty, Dr. Ballantyne, and Mr. and Mrs. N. J. Hancock. The evening's informalities came to an end with a loud crash at 11 o'clock, as the library expressed its own indignation at all this frivolity by breaking a pane of its showcase glass on the foot of a strictly anonymous graduate—or student.



NAVAL TRAINER: The first of its type (previous so-called Sea Balliols having been "hooked" R.A.F. Balliol T.2s), this prototype Sea Balliol T.21 made its maiden flight on October 23rd. Mr. R. P. Mancus, seen on the right, was the pilot. A note on the Sea Balliol T.21 appears on page 615.

HERE AND THERE

Anglo-U.S. Conference Date

UNDER the auspices of the Royal Aeronautical Society and the Institute of the Aeronautical Sciences, the Fourth Anglo-American Aeronautical Conference will be held in London from September 14th to 17th, 1953.

R.C.A.F. Comet Crews

IN preparation for the establishment of its Jet Transport Flight at Dorval, the R.C.A.F. has sent more than 60 officers and other ranks to this country for Comet training. Thirteen of them—nine senior Air Transport Command pilots, two navigators and two radio officers—will take courses at the de Havilland factories. The pilots have already made Comet familiarization flights between Britain and Singapore by arrangement with B.O.A.C. The R.C.A.F. expects to take delivery of its two Mk 1a Comets early next year.

Titanium Progress

FOR the past three years, Imperial Chemical Industries, Ltd., have been carrying out a research programme for the production of wrought titanium and its alloys. The company now announces that a stage has been reached when immediate work can begin on the construction of pilot plants that will provide a British source of supply for prototype work in the practical use of these materials. In America, two pilot plants are in operation, and there is another in Canada. The spectacular possibilities of titanium in aeronautical engineering were reviewed in an article in *Flight* of June 27th last.

Mystère IV's 683 m.p.h

THE French Air Ministry claimed in Paris on November 5th that a Marcel Dassault Mystère IV jet fighter, piloted by Constantin Rozanoff, reached a speed of 683 m.p.h. at a height of only 65ft. Another test pilot—Charles Monier—is said to have flown a Mystère III two-seater night fighter prototype at 656 m.p.h. Synchronized with the above claims came an announcement that the U.S. Government has ordered 250 Mystère IVs—presumably an off-shore purchase.

The Long Arm

A DAKOTA of the R.A.A.F., carrying four crew-members and two scientists of the Commonwealth Industrial Research Organization, was reported missing on October 27th after flying 50 miles out to sea from Sydney to observe a rainstorm; the scientists, R. S. Styles and F. W. Campbell, were engaged on rain-making research. Later, air/sea rescue craft found an empty dinghy, evidently swamped by heavy seas. By a strange coincidence, on the same day, an American pilot, Gordon Clauser, disappeared while flying out from Miami, Fla., to "attack" an approaching storm. He was the owner of a hail-prevention company in Oklahoma.

Still Branching Out

TWO more branches of the Royal Aeronautical Society—one at Henlow, Beds., and the other at Merthyr Tydfil, South Wales, are being formed. This brings the total number of R.Ae.S. branches in the United Kingdom to 23.

Jap Jets—

ACCORDING to a report from Tokyo last Monday, the Omija Fuji Industrial Company has designed an aircraft gas-turbine "only half the weight of an American jet engine"; it is expected to be ready in two years. The Sumito Metal Company is producing suitable heat-resisting steel.

—and Airframes

THE Japanese technical mission which recently visited this country is now in America, where its eleven members are studying the aircraft industry. Their declared object is to discuss assistance which Japan can give to the Western Allies by the repair and maintenance of aircraft. According to their spokesman, they will be in a position to execute such work next year, but production of complete aircraft "cannot be resumed for between five and ten years."

Reservoir Reconnaissance

BRISTOL WATERWORKS executives recently made two survey flights in a Bristol 171 helicopter in order to study the work in progress under their current reservoir-development programme. The deputy-chairman, Mr. C. Cyril Clarke, said of the flight in which he took part: "We were away for only an hour on a journey which would have taken us days by road. We had a splendid view of the work in progress—it was like having a map at our feet—and the flight will provide information of great value to our technical experts. Part of the area would have been difficult to inspect on foot."

THE I.C.A.O. CONFERENCE held recently in Rome was commemorated by the issue of this special Italian postage-stamp.

G.E.C. Missile Research

THE G.E.C. Research Laboratories are proposing to set up a unit at the Long Range Weapons Establishment, Salisbury, near Adelaide, Southern Australia, for trials and further development of guided weapon equipment on which they are at present working in the United Kingdom.

Relations Reunion

SIR MILES THOMAS, Chairman of British Overseas Airways Corporation, and Air Chief Marshal Sir Hugh P. Lloyd, A.O.C-in-C. Bomber Command, will speak at the sixth annual dinner of the Air Public Relations Association, to be held at the Press Club, in London, on Friday evening, November 21st. A. Cdre. Lord Willoughby de Broke, war-time Director of Public Relations, Air Ministry, will preside.

Russian Fighter over Japan

TWO Thunderjets of the United States Far East Air Force, patrolling last week over the eastern part of Hokkaido, one of the main islands of Japan, reported sighting a fighter with Soviet markings. The Thunderjets flew parallel with the intruder until they approached the international boundary, where they broke contact. The incident occurred not far from the scene of the recent attack by Russian fighters on a B-29; following this attack, U.S.A.F. aircrews have been given authority, in any similar circumstances in the future, to return fire in self-defence, "at their discretion."

For Information

A LIMITED number of certain *Flight* reprint and pictorial publications is still available, and we have reserved them for schools, scientific societies, spotters' clubs and similar organizations. Details are: *British Aircraft to Scale* (miniature plan-views, with engine-type, span and weight, of military, civil and research types as at September, 1951); *Turbines for Aircraft* (a 1946 reprint explaining, with colour illustrations, the basic principles of the gas turbine); and 30in × 20in "cut-away" charts of the Rolls-Royce Derwent, Metrovick F/3 ducted-fan engine and D.H. Goblin 2. *British Aircraft to Scale* is priced at 1s 6d; *Turbines for Aircraft* is free of charge; and the wall-charts are available at a reduced price of 1s each. We repeat that circulation is restricted, as above.

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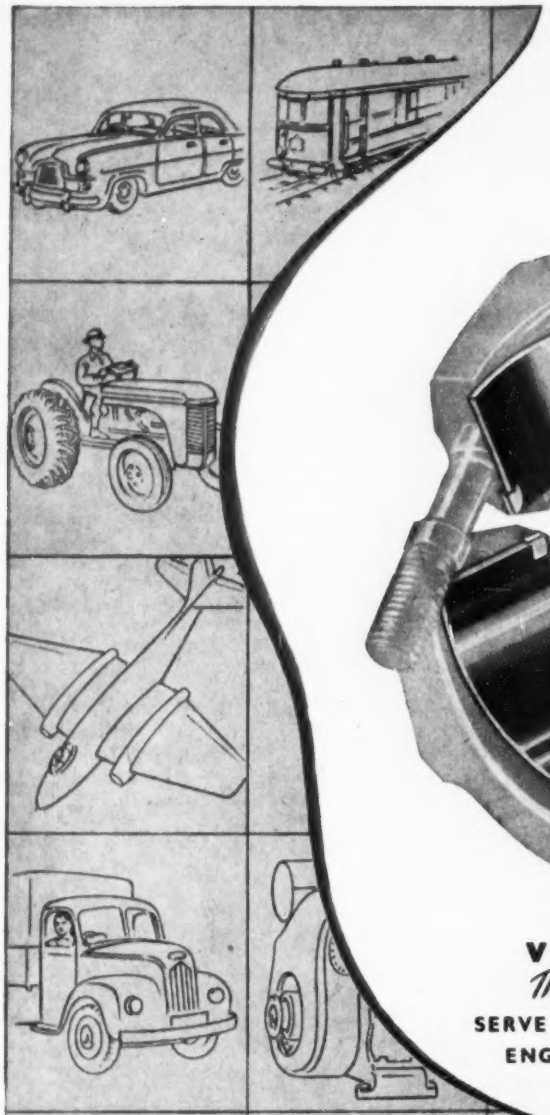

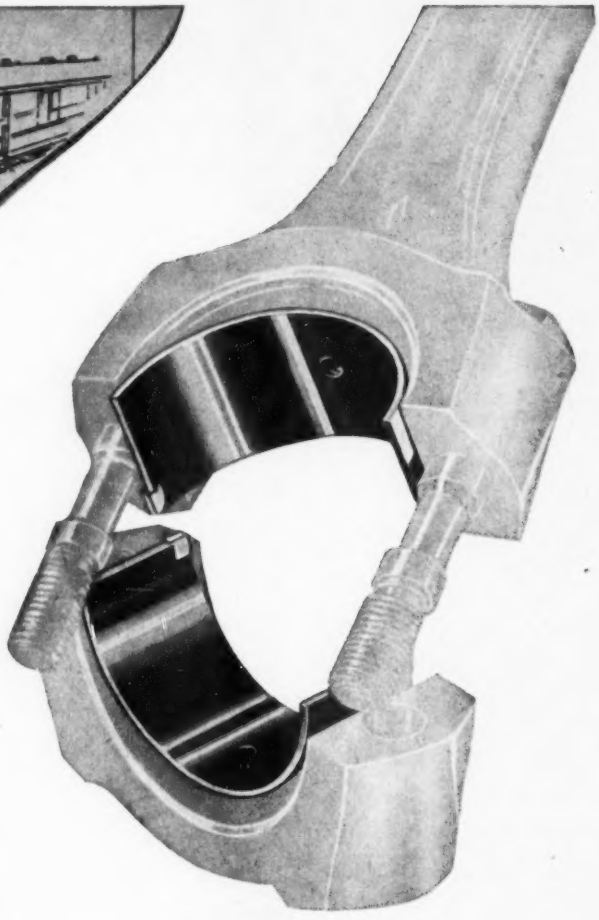

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THE TECHNICIAN'S DILEMMA

A Career in the Aircraft Industry or . . . ?

THESE pungent criticisms of the rewards and opportunities offered by the British aircraft industry are, in effect, a commentary on the talk given recently by Lord Hives at Nottingham University (see "Flight," October 10th). It may be that the writer has over-stated the case, but, on the principle that there's seldom smoke without fire, we gladly accord him space for his opinions.

EVERY profession has its customs and fables, unwritten laws revered by the layman, but seldom justified by experience; and for all its prestige the aircraft industry is no exception to this rule.

A common misapprehension has existed, throughout all aviation history, that aeronautics is suspended in a world of its own, complete with its cast of Dickensian and Hollywood characters acting a plot of mechanical and bloodless revolution. The bark-garden garage of the early days, with untidy enthusiasts building contraptions of wood and wire, has given way to the modern conception of the "back-room boy," so absorbed by his science that he forgets his wife's name and the number of his house. Many people in the industry itself are flattered by such typical public conceptions of their occupation. Indeed, the phrase "I work in aircraft" induces a sense of awe and social prestige, and the comment "you are a lucky fellow to have such an interesting job."

It is then that the technician feels a little personal discomfort and lapses into uneasy silence rather than give away the real truth of the matter—that technical work in aircraft can be as boring, tedious and disheartening as in any other branch of engineering; for if he destroys his own illusions about the industry there is little else to compensate for his choice of career.

In spite of the popular romance about aircraft, recruitment for the industry is deteriorating both in quantity and quality. Lord Hives, chairman of Rolls-Royce, Ltd., sounded a warning note in his recent lecture, "What industry requires from the Universities." He did not suggest that there was a shortage of potential brains in the country, but complained that the aircraft industry was not attracting its proper quota.

The main cause of this shortage, in the writer's opinion, lies in the plain fact that aircraft design and research is losing much of its previous magnetism. This applies equally to those already engaged in a large section of the industry as well as to potential recruits. Even the marvels of Farnborough do not compensate the intending engineer for the financial propaganda that he hears from those in the industry. Aircraft are not plated with gold.

The Drift Overseas

Thus, disappointed young technicians are leaving aeronautics for no better reason than they cannot afford to stay in it; or, if they have the inclination and no family or other ties, they drift to Canada and the United States, where their training is more appreciated and rewarded. At home they are going into their father's businesses, exchanging aeroplanes for automobiles, transferring to the sales and publicity staffs of commercial companies, or taking up teaching and lecturing.

This last-named profession is one which has had to change its mind about staff recruitment. The original idea for attracting the enthusiastic teacher was to ignore personal suitability and to pay poor salaries—this was supposed to test the enthusiasm. Nowadays, most candidates must face the scrutiny of the interviewing board before being accepted into a vital and rejuvenated profession that has learnt to offer reasonable and progressive salaries to all grades of its staff.

Lord Hives mentioned the increasing popularity of the arts. This is a reaction which may appear justified if one considers the history of a student leaving school with engineering ambitions. Honours graduates with three years' residential university experience and a further two years of practical training are wanted by the industry. On top of this, two years must be served in the Forces. In all, the victim has seven years to complete before he can settle down to industrial life. For most graduates, living on scholarships and grants—which, though plentiful and generous these days, are still no more than monetary permission for advanced education—the financial path is hard and stony. Indeed, after three years of university life and two in the Services, it is only the veritable recluse who does not find himself in debt. When finally he embarks upon his long-dreamt-of technical career, the graduate is casually accused of "no experience" and discovers that he is apparently of no more immediate value to the company than is denoted by a salary often less than that of a man who has been earning throughout his apprenticeship.

Unlike the American corporations, the British aircraft industry is not prepared to pay for potential technical value. This attitude is unquestionably a relic of the immediate pre-war years, when a B.Sc. was a ten-a-penny qualification, and the industrial attitude was, "We must concentrate on developing the administrative and commercial departments, as we can always buy technical brains." As a result, honours graduates qualified in their profession, but impecunious from their years of training, were employed at salaries that would have offended any young solicitor, accountant or doctor.

Unfortunately, engineering has never been regarded by the community as a profession on a par with medicine, the law, accountancy or entertainment. The latter deal with human beings, their affairs and circumstances, and fees are charged and paid as such. For the men who construct "infernal machines," remuneration is decided, either on an impersonal basis, by the rules of custom or, at the other extreme, by unmitigated bluff and haggle between employer and employee, in which there is no dignity for either. Hence a potential profession becomes just another "occupation."

The flow of new technicians might, however, be stimulated if a lump sum was given by a central authority to graduates (who complied with stated training requirements) as a recognition and compensation for the unrewarded years. This suggestion may astonish those who consider personnel problems only from the point of view of efficiency programmes and industrial economics. It must be remembered that the R.A.F. is, at the moment, attracting the cream of British youth by a similar consideration. At the end of a short-service commission a gratuity of up to £1,500 is awarded, a sum which no technician in Civvy Street could amass over a similar period.

There are other deterrents for the intending technician, which unfortunately apply to a large section of the industry. The prospect of promotion is a serious problem. From the point of view of the *average* technician, an aircraft design-office, by the very nature of its work, offers less *responsible* positions than any professional office of a similar size; yet the main body of the technical staff must be as qualified (if not more so, in specialized work) as the head of the department—whose job is becoming increasingly administrative, and who must learn to co-ordinate rather than calculate.

The introduction of posts similar to vice-president rank in an American organisation (so often sneered at in this country) would effectively increase inter-departmental efficiency, and that of the company as a whole, and at the same time create new posts of technical responsibility within the design department which would provide a practical and recognisable incentive for the junior staff.

"Horizontal promotion," as advocated by Lord Hives, does not pay in the long run from the firm's point of view. In fact, the recent trend in most technical offices is to keep one man on one job so that, in effect, the design programme is covered by a series of experts. It must be admitted that this policy ensures that the technician receives a minimum overall experience, and effectively holds him in the only post for which he is immediately suitable at a salary about which he is unable to argue. Stone walls do not a prison make, but specialization is as good a cage as any.

The present shortage of technicians in the aircraft industry might be eased, therefore, by the provision of more recognized and responsible posts within the technical departments, a reduction in specialization where practicable, a clarification and general upgrading of all technicians' salaries, and post-training gratuities for new and recent graduates who are beginning to suspect that the aeronautical land of milk and honey is, in fact, financially sour.

J.H.W.W.

THE PARIS SHOW

OFFICIALLY entitled the 20th International Aeronautical Meeting, next year's "Paris Show" will, as already announced, take place at Le Bourget between June 26th and July 5th. It is now learned that one day will be devoted to commercial aircraft, one to private aircraft and one to helicopters. An "international flight exhibition," restricted to members of French and foreign civilian and military commissions, technicians and Press correspondents, will take place on Saturday, July 4th, and the public will be enabled to witness a similar programme on the following day, when French and foreign military formations will also participate.

In connection with the show, the Association Française des Ingénieurs et Techniciens de l'Aéronautique will be holding its traditional congress. This year's discussion-subject will be "The Production of Airframes," and texts of papers must be submitted by June 10th; details are obtainable from A.F.I.T.A. at 6 Rue Cimarosa, Paris, XVIe.

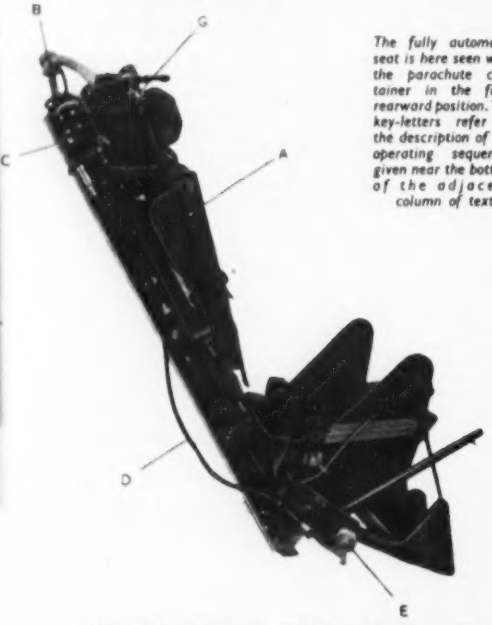
UP, OUT and DOWN

Development and Operation of the Martin-Baker Ejector Seat

THE United States Air Force recently held a symposium at Wright Field, Dayton, Ohio, on the subject of the emergency escape of the crew from modern aircraft. It was fortunate that Mr. James Martin, O.B.E., F.R.Ae.S., was able—at short notice—to prepare a paper for delivery at this meeting. As director of the Martin-Baker Aircraft Co., Ltd., he has a knowledge of the subject that is unsurpassed. His paper is summarized here, with selected illustrations.

It was in 1944, said Mr. Martin, that he first conceived the idea of shooting a seat from an aircraft by means of an explosive charge. There were then no data available on the amount of acceleration which the human body could withstand, and tests with a seat mounted on an inclined ramp were initiated. After preliminary dummy testing live firings were made; one subject suffered a crushed vertebra and, although on this occasion the mean acceleration had been no more than 3½ g, it was found that the initial acceleration had been much higher.

The two-cartridge gun overcame this characteristic and also gave great consistency of performance under varying conditions of aircraft manœuvre. The acceleration/time curve for the 42in-stroke gun rose gradually at 220 g/sec to a maximum of 18.7 g, while the acceleration/stroke characteristic closely approximated to the ideal rectangular form.



The fully automatic seat is here seen with the parachute container in the fully rearward position. The key-letters refer to the description of the operating sequence, given near the bottom of the adjacent column of text.

Although it had been assumed that the ejected seat experienced no aerodynamic force normal to the airstream, some trajectories were found to have been much lower than had been estimated. Wind-tunnel tests showed an anti-lift component of some 22 lb at the ejection angle of 25 deg; this downward force vanished if the seat were tilted to an angle of 60 deg backwards, and further tilting produced positive lift. But attempts to increase the aerodynamic lift resulted in severe instability in yaw and the method had, temporarily, been abandoned.

In order to give satisfactory clearance over bomber fins an ejection velocity greater than 60ft/sec was required. The velocity chosen was 80ft/sec, and—since the acceleration and acceleration/time characteristics were already at their optimum values—a longer stroke gun was required, this value being increased to 72in. No measurable physiological effect resulted from this change. The additional stroke was obtained by the insertion of an extension tube, and the fact that the seat inertia relieved the aerodynamic load immediately after firing permitted the extension tube to be of fairly thin gauge. Other features embodied were an auxiliary cartridge to counteract the reduction in piston area at the end of tube extension and a non-bouncing shock-absorber for the tube itself.

After ejection at any aircraft speed visualized, the airspeed of the seat would fall below 400 m.p.h. within two seconds. The seat canopy could not be opened above 150 m.p.h. and a drogue was employed to decelerate the seat rapidly to below this figure. But the drogue, in turn, could not be opened safely until the seat speed had fallen well below possible aircraft speeds; some delay in drogue firing was essential and a time-delay mechanism was therefore incorporated. Further testing showed that spring-ejection of the drogue was insufficiently powerful; a drogue gun was developed to shoot the drogue clear of the seat vortex and so stabilize the seat rapidly.

Mr. Martin went on to describe the standard Martin-Baker Mk 1 (non-automatic) seat, which had formed the basis upon which the automatic seat had been developed. [The manufacture of Martin-Baker seats was described in detail in a series of articles in the May, June and July, 1952, issues of our associated journal *Aircraft Production*.—Ed.] The Mk 1 seat had been in use in British and foreign air forces for a number of years and had saved many lives, both after loss of control and under actual combat conditions in Korea. Mr. Martin cited the case of a fighter-reconnaissance aircraft which started to break up in an almost vertical dive at 10,000ft. At a Mach number of 0.74 the starboard wing broke off, followed by the tailplane and port wing; ejection was effected at about 550 m.p.h.—believed to be the highest speed at which an ejection seat had been used—and the pilot found the seat easy to operate and made a safe landing.

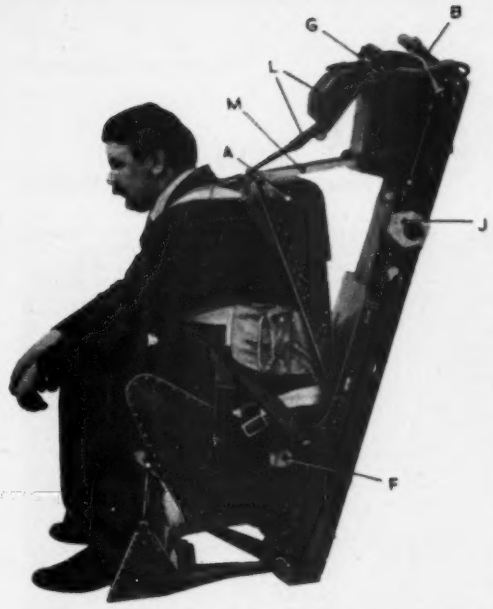
Experience had shown that it was desirable for personnel to be given practical instruction in the use of ejection seats. A number of training towers had been built for this purpose and the most recent development in this connection was a 40ft mobile tower which, mounted on a standard 60ft trailer vehicle, could be driven round to operational stations.

Early in 1947 Mr. Martin had concluded that a fully automatic ejection was a necessity. The functioning of the seat had to be such that, after firing, the occupant would be ejected from the aircraft, released from the seat and his parachute opened without any further action on his part. Moreover, the seat had to be stabilized and retarded to the safe opening speed of the personal canopy (about 150 m.p.h.) as rapidly as possible to provide for low-altitude ejections and, further, should ejection take place at high altitude, descent to below about 10,000ft had to be as rapid as possible. Finally, the crew-member had to be capable of using his parachute for an unejected escape if necessary.

The earliest pattern of automatic seat was superseded for two main reasons: the wedge-shaped pack was inconvenient for non-ejected escapes when it was carried on the man's back (it was a non-standard item of equipment) and it was found impossible to design a satisfactory two-position back-rest. The standard automatic seat now in production used a standard back-type parachute pack and harness with the ZD safety harness; further, it had a back-rest capable of being locked in any of several positions.

At the release of his seat harness there was a great risk that the pilot would fall out of the seat. The latter might be above him when he was slowed up rapidly as his canopy developed; then, with the seat falling at high speed, there was risk of collision. Flight tests with dummies had demonstrated this danger; in fact, in several cases there was a collision between the seat and the dummy. Had these been live subjects the results could have been fatal, judging by the markings on the sheet-metal head of the dummy. This difficulty had been completely overcome by attaching the airman's parachute harness to the seat by a pair of short straps terminating in spring-loaded locks on the seat pan, so that separation from the seat was delayed until the airman's canopy developed, unlocking the spring connection by the momentum of the seat.

Going on to describe the operational sequence, Mr. Martin said that the ejection of the seat up the guide rails started two time mechanisms, which were contained in the barostat-controlled delay mechanism C and the drogue gun J respectively [see accompanying illustrations—Ed.]. Two seconds after ejection the drogue gun fired and extracted the drogue from the box behind the head-rest. The drogue was attached to the seat by the scissors shackle B and stabilized and retarded the seat. Five seconds after



Mr. Bernard Lynch, B.E.M., in the Martin-Baker automatic seat, is showing the parachute container in the fully forward position.

ejection the barostat-controlled time mechanism C functioned and (1) released the drogue from the shackle B and (2) released the safety-harness box (E). The occupant's parachute harness was, however, still attached to the seat by the spring clips F.

The drogue, released from the shackle, then withdrew the quick-release pins G, freeing the rear edge of the face screen and the upper edge of an apron L from the seat. The drogue continued to pull the apron, which pushed the parachute pack forward in the container A and then extracted the canopy from the pack and pulled the lower edge of the apron away from spring clips. Finally, the pull of the developing canopy and the inertia of the seat broke the connections at the spring clips F, allowing the seat to fall away cleanly from the occupant—who was then suspended from his canopy and made a normal parachute descent.

A manually operated overriding control was provided for an unejected escape from the aircraft.

The ejection seat had been proved highly successful in service use at the speeds and altitudes at which it had so far been employed.

In Mr. Martin's experience, the maximum speed at which a Martin-Baker seat had been used was still, with two possible exceptions, the experimental ejection made by Mr. Bernard Lynch in August, 1947, at a true speed of 505 m.p.h. at 12,000ft from a Meteor 3. Lynch stated that even at this speed the air blast effect was negligible. It was significant that, although a number of emergency escapes had since been made from much faster aircraft, the speed at the moment of ejection was usually lower, which suggested that, although trouble might develop at very high aircraft speeds, the loss of speed due to closing throttles, structural damage, etc., was usually considerable and that an emergency ejection at the maximum speed of the aircraft was very improbable.

At very high altitude, although loss of consciousness due to anoxia might occur in spite of the emergency oxygen carried in the seat, it was believed that the rapid descent provided by the automatic seat (60,000ft to 10,000ft in three minutes) with automatic canopy opening would prevent any serious physiological effect.

Although with the non-automatic type of seat it was believed that 1,000 to 2,000ft was required for safe escape—depending on the rapidity of the airman's actions—with the automatic seat successful dummy ejections at 500ft above ground level had been made repeatedly.

Experience of emergency escapes from aircraft in various attitudes, including inverted spin and very tight turns, led Mr. Martin to believe that the attitude of the aircraft at the moment of ejection imposed no limitation on the use of the ejection seat.

As far as he could foresee, therefore, the situation was that ejection would provide a satisfactory means of escape for a long time to come, and his experience convinced him that an automatic ejection seat was an absolute necessity as in some cases pilots seemed to lose, after ejection, as much as 2,000ft in height before getting their main canopy working.

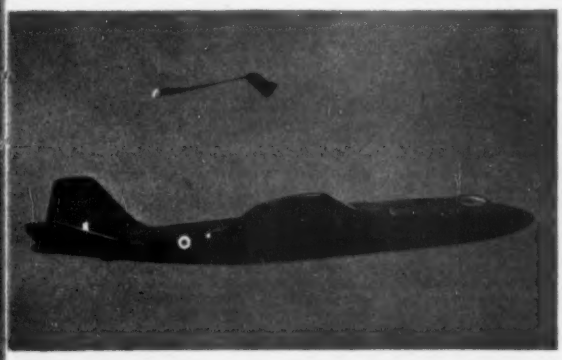
If the pilot appreciated that, once ejected, he had nothing further to do, he would gain great confidence. Added to this was the fact that, with the automatic seat, he was lifted out of his seat precisely 5 sec after being shot out. In view of the fact that the pilot was falling through the sky at something over 200ft/sec, it was vital, when considering low altitude ejections, that there was no "if" about the mechanism working.

Mr. Martin had designed an automatic conversion set, the components of which bolted on to existing seats to convert them to fully automatic functioning.

The lecturer concluded by expressing the hope that, in the course of the next few months, all Mk 1 seats throughout the world would have automatic facilities fitted.

TESTING the AUTOMATIC SEAT

AS explained by Mr. James Martin, in his lecture summarized above, a fully automatic ejection seat is greatly preferable to one in which the occupant has to release his seat harness and pull his rip-cord manually. The introduction of the Martin-Baker automatic seat has necessarily involved a certain amount of testing, including actual flight ejections. This testing also embraced the examination of the different types of equipment which confer the automatic quality, and of the behaviour of the seat after ejection at high speed.



It soon became apparent that no suitable testing site was available in Great Britain, and careful consideration resulted in the choice of Castel Benito airport, Tripoli; a further asset of the North African locality was the clear air essential for air-to-air photography. The test aircraft was a Canberra B.2 and, on its way to Tripoli, it incidentally established a world point-to-point record of under 2½ hours. A Meteor was used for photographing the ejections—a frame from the ciné film appears on this page—and a Viking carried the R.A.F. and R.A.E. test team.

Writing in the *R.A.E. News*, a member of the party has recorded his pleasant impressions of Tripoli and, in fact, of the new Kingdom of Libya in general. Castel Benito proved very suitable for the testing and, since all ejections were made from low level, they were conveniently carried out over the airfield itself. In spite of erratic met. winds and, at one time, a row of Hastings along one side of the dropping zone, the seats were all landed in the prescribed area. Bumpy air prohibited high-speed mid-day flying, and the early morning ejections and the work of seat loading and preparation—which often went on until nearly midnight—involved very long hours of work. But most successful results were obtained and, according to the *R.A.E. News* contributor, the work was completed much sooner than would have been possible in the British Isles. The introduction of efficient automatic seats to the Services should not now be long delayed.

The seats under test were fired from one of the navigators' cockpits of the Canberra. This photograph, taken from the accompanying Meteor, shows the drogue, fired from its gun, stabilizing the seat after ejection.

ELASTIC NAVIGATOR

—a Private Pilot's Ingenious Gadget

A PACKAGE recently arrived at these offices bearing the somewhat ambiguous designation "One Elastic Navigator—With Care." Inside was a sheet of "half-million" air map wrapped around a square of thin steel sheet. Stretched across the map was a length of single-strand, cotton wound elastic, marked off at regular intervals; spread over the map were a number of steel objects each about one-half-inch long. And from the accompanying literature we learned that the invention was the work of Mr. V. Tyler, of Chelmsford.

In common with most spare-time pilots, Mr. Tyler finds that in the cockpit, he adds two and two and makes it five; with his device in operation he requires no airborne calculation at all. To illustrate its operation he uses the example shown in the sketch. The required section of map is held against the steel plate and kept in place by rubber bands; between the map and the plate are two thicknesses of paper. The steel objects are basically miniature bar magnets, as illustrated.

The graduations on the elastic are equivalent to one minute's flying time in Mr. Tyler's Auster, with a larger marking every five minutes, as shown in the left-hand sketch below. If ground-speed is found to be greater than estimated, the elastic is stretched accordingly. Course and E.T.A. are calculated, using the met. wind. Any convenient five-minute mark on the elastic is then taken as representing 0830 hr (estimated time of setting course), and is clipped down over Chichester harbour, from which course is set. A second clip holds the E.T.A. of 0918 over Gravesend.

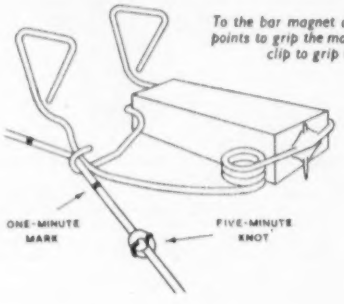
Once airborne, course is set at 0832, so the elastic is pulled through two small divisions. At 0844 a railway is crossed; this is one minute late, so the Gravesend clip is moved from (1) to (2) to bring 0844 over the railway. G.S. made good is now known. A fix is then made—with the aid of the elastic—over Loxwood church at 0851; so the Gravesend clip goes to (3), to bring 0851 over Loxwood. (Note that the line joining (1) and (3) is the wind error to the groundspeed elastic scale.)

An alteration of course is required, and 0853 is chosen to give time for preparations. This time is clipped down to keep 0851 over Loxwood, and the Gravesend clip is brought to (4), showing the new required track; course alteration is estimated at 15 deg starboard. The position (4) is judged by eye, keeping the same radius from the 0853 turning point as position (3). After setting the compass and gyro the turn is made at 0853—no visual landmark being needed. At 0903 a fix is obtained south of Reigate; the Gravesend clip is moved to stretch the time scale to allow for the new G.S., but no alteration in course is required, the clip going to (5). The E.T.A. can then be read as 0924.

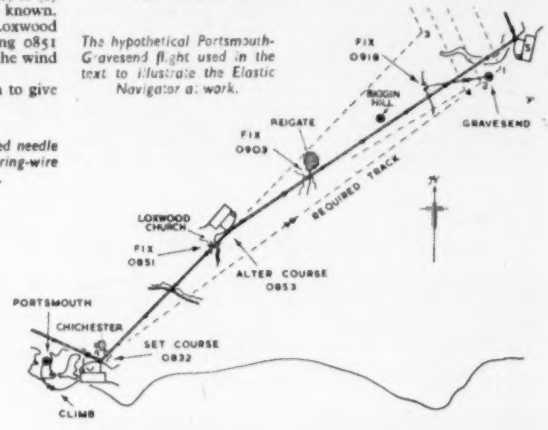
At 0913 Biggin Hill passes rather close to port and a final fix at 0918 shows a northerly track error. An immediate alteration of course 25 deg S can be made by direct estimation; the elastic need only be re-clipped over the fix if conditions are bad. And so we get to Gravesend.

Given good fixes, and resisting the tendency to fix at a pinpoint as soon as it passes under the nose of the aircraft, very accurate navigation should be possible. On landing one has a graphic track record, from which times can be read directly. The map is, of course, unmarked. The apparatus is small and handy and, in Mr. Tyler's experience, no magnetic-compass errors result from the bar-magnet clips.

Mr. Tyler's treatise closes with the following observations: "A few trips in good conditions . . . watching pinpoints appear as if each were tied to a particular mark on the elastic, produces the confidence necessary to fly over a long stretch of unbroken cloud, sure of the ability to locate one's self immediately on descending through it. One can become dependent upon the system to the extent of getting out of practice with the more basic methods . . . I fear that one day, when my son comes to me with the perennial complaint "I can't fly my aeroplane, Daddy, the elastic's broken," I shall reply, simply, "Me too."



To the bar magnet are attached needle points to grip the map and a spring-wire clip to grip the elastic.



The hypothetical Portsmouth-Gravesend flight used in the text to illustrate the Elastic Navigator at work.

BALLISTIC SUPERSONICS

A NOTE on supersonics, recently published in the staff-organ of the Pearl Assurance Co., appears to have touched upon the first occasion when such phenomena were of practical importance. Relevant passages are as follows:—

"The sound barrier is by no means a novel conception. Field artillerymen of 1914-1918 will remember the controversy concerning their two weapons—the 4.5in howitzer (high angle, slower than sound) and the 18-pounder gun (low angle, faster than sound); why could not the two be combined in one piece firing variable-propellant charges? The main objection was that intermediate charges would be useless owing to instability of the shell fired at or near the speed of sound, and it was not worth while producing a new equipment to fire only two charges. Yet this objection was only theoretical, and between the wars the idea was tested and found satisfactory, so that by 1939 the multiple-charge "gun-howitzer" was an accomplished fact.

"Experience in the 1939-1945 war confirmed that the comparative accuracy of gunfire was not diminished when the velocity of the shell either approached or passed the speed of sound, even though, during its flight, a supersonic shell may pass through the so-called barrier twice, whilst decelerating on its way up and accelerating on its way down. Photographs of shells in flight exhibit no extra instability at or near the speed of sound; moreover, through the medium of the atmospheric dust, the sound waves from these are clearly shown and . . . they form a regular pattern and exhibit no undue disturbance.

"Does all this throw any light on the behaviour of a high-speed aeroplane? To some extent the two are not comparable, since one has the better ballistic properties and the other increases its inherent instability by carrying its own motive power. But these differences merely complicate the issue and we can only hope to isolate the gold by sifting out the sand."

Do you know your airfields?

30

Recognise this airfield? It is No. 30 in this series of puzzle photographs. You'll find the answer below on the right.★

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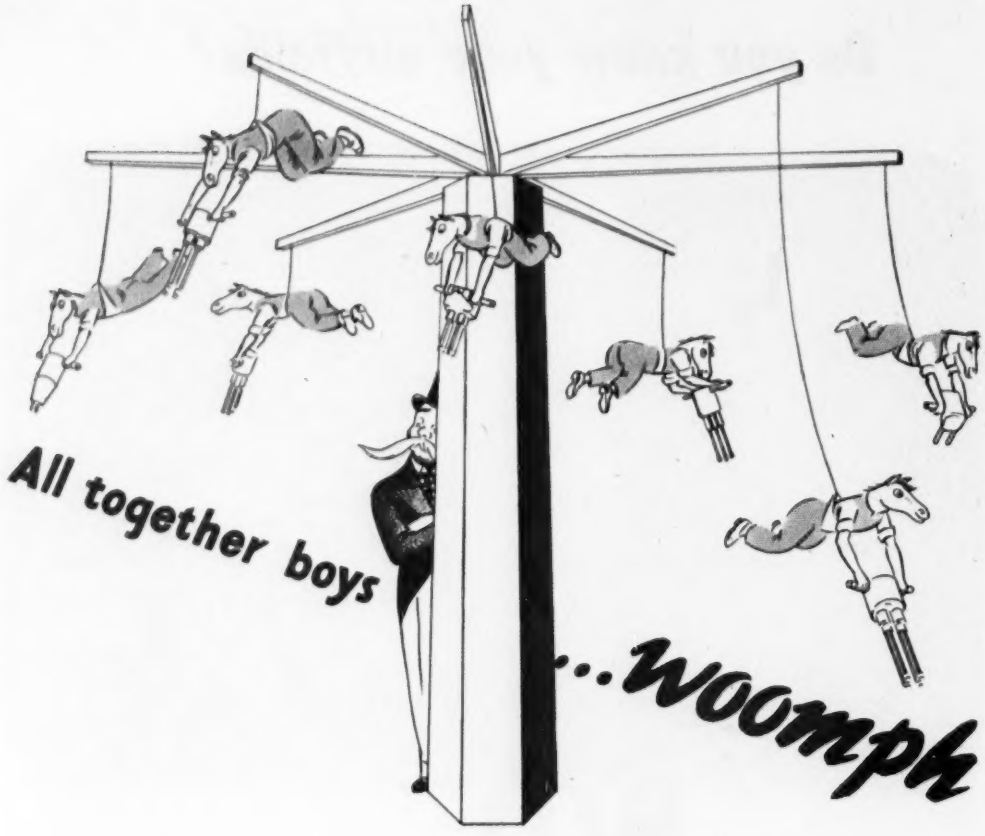
Shell and Anglo-Iranian Oil Groups.

★ Shoreham Airport



OUR LITTLE HORSES think it's a new and lovely game. Round they swing and one after another they are pulled down, each to do some assembly job on an Austin car. Little Joe will fasten on the engine. Frederick, Sebastian and Montmorency come down as a team and deal with the brake link. The Quads fasten the four wheel nuts in one operation.

All assembly in this new Austin Plant is done by our Little Horses and very proud of them we are. And a nice man with curly hair on the Austin Assembly Line said *he* was proud of them too.

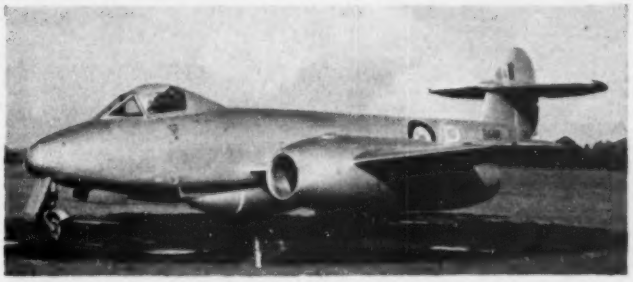
Desoutter

POWER TOOLS INCREASE PRODUCTION

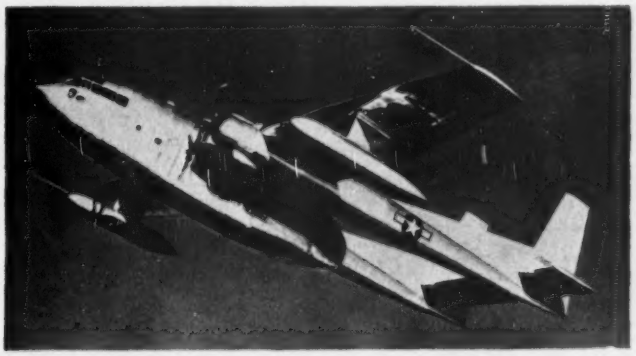
DESOUTTER BROS. LTD., THE HYDE, HENDON, LONDON, N.W.9 TELEPHONE : COLINDALE 6346 (5 LINES) TELEGRAMS DESPNUCO, HYDE, LONDON CRC337

AIRCRAFT INTELLIGENCE

HERE introduced is a new topical feature intended to acquaint technicians with week-to-week news of progress in design and developments at home and abroad. We feel sure it will also earn the approval of recognition enthusiasts and collectors of aircraft data and photographs.



NEW (FRENCH) WHINE . . .: In this GlosterMeteor flying test-bed two S.N.E.C.M.A. Atar 101.B.21 turbojets have been installed by Air Service Training, and the first flight was made at Hamble on October 31st. The airframe—RA491—is that of the former Avon-Meteor. Basically a Mk 4, it embodies a Mk 8 forward portion and the spars are non-standard.



PRIZE PACKET: The Fairchild C-119H Packet has an entirely new wing and tail unit, and carries all its fuel in under-wing tanks which are remote from the power plants and electrical circuits.

Great Britain

Boulton Paul Sea Balliol T.21. The first "pukka" prototype of this naval deck-landing trainer—serial numbered VR599—made its initial flight on October 23rd. A photograph appears on page 610. Former Sea Balliols were merely "hooked" Balliol T.2s, but the new machine further differs from the R.A.F. type in having a smaller-diameter airscrew, new undercarriage and tailwheel units, and various alterations and additions to equipment and instrumentation to meet Naval requirements.

Civil Registrations. Registration letters for the second and third Saunders-Roe Princess flying-boats are published in the November issue of the A.R.B.'s *Register of British Civil Aircraft*. Princess No. 1 is registered as G-ALUN; the letters G-ALUO and G-ALUP have been allocated to her sister ships.

Ex-R.A.F. transport aircraft acquired by independent operators figure prominently in the list of new registrations, which include: G-AMUL, G-AMUM and G-AMUN (York C.1s operated by Scottish Aviation, Ltd.), G-AMUS, G-AMUT, G-AMUU and G-AMUV (York C.1s acquired by Air Charter, Ltd.), and a number of Dakotas—G-AMVB and G-AMVC (B.K.S. Aerocharter, Ltd.), G-AMVK and G-AMVL (Transair Ltd.) and G-AMVA (Eagle Aviation Ltd.).

Hants and Sussex Aviation, Ltd., have acquired seven D.H. Tiger Moths—registered G-AMVE–J inclusive and G-AMVO; G-AMUW is the registration allocated to a Luton Minor 1. Another addition to the Register is Dove G-AMUZ, owned by the Iraq Petroleum Transport Co., Ltd.

The cost of annual subscription to the *Register*, which appears monthly, has been increased from five to ten guineas; announcing the increase, the A.R.B. states that its publication has involved a loss for many years, and the change from card-index to book form did not produce the required number of new subscribers.

U.S.A.

Republic F-84F. The Republic company is said to be studying the possibility of replacing the Curtiss-Wright J-65 turbojet (Armstrong Siddeley Sapphire licence), initially standardized for the swept-wing F-84F Thunderjet development, with the General Electric J-73. Westinghouse and Allison jet units are also being investigated.

McDonnell F-101. According to our contemporary *Aviation Week*, the McDonnell F-101 fighter, which is being developed in the light of experience with the XF-88, may have one of the thinnest wings yet designed. The root thickness/chord ratio is reported as 6 per cent, with a reduction to 4-4½ per cent at the tip.

Martin XP6M-1. Unofficial reports give the foregoing as the designation of the Martin Model 275 SeaMaster high-speed jet-propelled flying-boat ordered by the U.S. Navy. It is understood that the new boat will have four turbojets—either Pratt and Whitney J-57s or Wright J-65s (Sapphires).

Convair Supersonic Bomber. A writer in *Aero Digest* concludes that the next era in bombing aircraft will see performance raised to the "700 m.p.h. level," and remarks that Convair is "well advanced on the weapon for the supersonic bombardment age." What he does not add is that there is good reason to suppose that the new bomber will be a thin-winged delta.

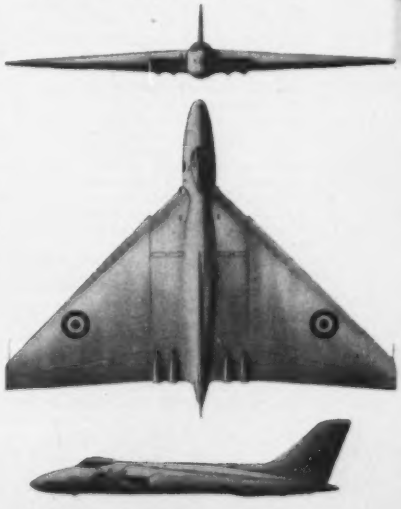
France

Nord 2501. The first production-type Nord 2501 twin-boom, Hercules-powered transport built for the French Air Force, made its first flight on October 24th at Les Mureaux, and the second machine should fly in a few weeks at Bourges. Production of this useful, Packet-like, machine is split: fuselages are made at Bourges by S.N.C.A.N.; tail booms and empennages at Les Mureaux by the same company; and wings at Anglet in the Bréguet factories.

Fouga CM-170R. One of the two prototypes of this twin-jet two-seater trainer, a sectioned drawing of which appeared in our issue of October 31st, was destroyed in a crash at Toulouse/Blagnac on November 3rd. Both occupants were killed. It is learned that a conventional type of tail will eventually replace the butterfly tail as fitted to the first two machines.

Leduc 0 21. Construction of this ramjet prototype, which is to be more powerful than the 0 16 now flying, is well advanced. A subsonic fighter, the 0 21 will be air-launched from a Languedoc. Trials should begin during the spring of next year.

Avro Vulcan B.1 (four Rolls-Royce Avons).



SWEDISH AERONAUTICAL RESEARCH

Current Work at Two Progressive and Well-equipped Establishments

TWO centres of aeronautical research about which little is generally known in this country are the Division of Aeronautics of the Royal Institute of Technology (Flygtekniska Institutionen, Kungliga Tekniska Högskolan), and the Swedish Aeronautical Research Institute (Flygtekniska Försöksanstalten), both in Stockholm. A recent visit to Sweden by a member of the staff of *Flight* enabled some useful information on these establishments to be obtained.

Although the Institute of Technology is largely concerned with the training of students, the Division of Aeronautics has for some time paid increasing attention to the development of its aerodynamic research activities, both fundamental and applied. From 1933 to 1945 the emphasis had been on academic training and students' thesis work—the practical needs of which were satisfied in the aerodynamic laboratory by the 5ft by 7ft low-speed tunnel—and there had been only a small staff. In the autumn of 1945, Professor S. Luthander, who had previously helped in the planning of the Government Aeronautical Research Institute, was appointed head of the division, and considerable expansion of its work and facilities followed, with the prospect of contracts from the Swedish Air Board and aircraft manufacturers. Two years later the division's new building, to house the additional personnel and equipment, was complete, and the 33 cm by 34 cm supersonic induction-type tunnel was being constructed.

High-pressure inducing air for this tunnel is supplied from a 250 h.p. compressor, via 110-atmosphere submarine storage bottles, and by means of interchangeable liners a selection of working Mach numbers from 1.15 to 1.8 is possible. Measurements of pressure and force are made by means of mercury manometers and strain-gauges respectively, and the tunnel came into use in 1949. A second supersonic tunnel, also using the above-mentioned storage bottles, has since been built; it is designed for operation at a range of Mach numbers from 2 to 4 and a settling chamber pressure of 20 atmospheres. In addition, a high-speed tunnel for the investigation of boundary-layer effects has been designed and constructed, with slot suction ahead of the working section for control of boundary layer thickness. Various Reynolds numbers can be obtained by changes of pressure.

At present, those three tunnels are not used by the students of the Institute; instead, they complement the work of the Saab and F.F.A. tunnels in meeting contracts from the Swedish Air Board and from the Saab company.

Low-speed Research

In parallel with the above developments has come an expansion of the low-speed branch of research; there now exist three additional low-speed tunnels, designed for special purposes. The first of these is a 2ft by 1ft open-circuit tunnel, with a maximum air speed of 130ft/sec, which was built initially to investigate plan profiles. After research use for a commercial firm intending to make reversible fans, the tunnel has been available for students' thesis work on general low-speed subjects. One interesting investigation, commenced as a thesis subject and since continued, concerns model-aircraft profiles, and has formed the basis for the design of the Swedish models which have been notably successful in recent Wakefield Cup competitions. First Engineer B. Koch mentioned, however, that no report on this subject was yet available. Another low-speed tunnel has a 1½ft by 3ft working section and maximum air speed of 100ft/sec, and is at present using half-models to study the design of air intakes. Both these tunnels possess upstream contraction sections designed according to Thwaites' two-dimensional theory. There is also a 1 m by 7.5 cm smoke tunnel, using a heavy paraffin-base oil as the smoke generating fluid; it has a maximum speed, with good filament flow, of 100ft/sec. All three low-speed tunnels feature fine mesh screens upstream of the contraction, to reduce turbulence, and possess a common suction system with centrifugal blowers driven by separate electric motors.

During the past few years, in addition to the expansion of the wind-tunnel test section, theoretical work on an increasingly large scale has been performed, both on fundamental and applied research. Separate theoretical groups have been formed, studying problems in such fields as transonic flow, unsteady aerodynamic forces, and boundary-layer research. With the measurement of the "damping in pitch" derivative in the supersonic tunnel, and of many stability derivatives in the low-speed tunnels, came the need to solve complex mathematical problems, including the linear differential equations which form the basis for stability investigations. For this purpose an analogue computer was designed and built and is now used both in connection with the Institute's own wind-tunnel work on stability and also in solving equations for Saab, under contract agreement.

Problems connected with the high local velocity peaks at surface junctions, at speeds approaching M=1, have been studied, using the experimental analogy of fluid flow and the passage of electricity through a conducting medium. Electrical measurements in a water-filled gradient tank have thus replaced the normal wind-tunnel pressure measurements in studying such local velocity increments. The gradient tank has been found useful also for investigations into unsteady aerodynamic forces, and the method, having been successful for two-dimensional models, is now being extended for three-dimensional work.

Wide Scope of Work

We were shown around the Division by Herr Koch, and by Mr. Alan R. McLean, a British aerodynamicist at present engaged on high-speed subsonic research at the Institute. Approximately 65 people are employed there, and the Division possesses its own drawing office, workshops and electrical section—an interesting product of which is their unbonded-type strain-gauge, used in all supersonic tunnel force measurements. The major part of the Division's work is performed under contract from the Government and Saab, and information on much of it is restricted, as a security measure. In general, fundamental research is carried out by the theoretical groups, and applied research by the experimental teams, although in particular investigations the two branches work together. A good example of this combined work has been in the transonic field, in connection with which a number of reports have been published in the Division's series of technical notes.

Past work has included wind-tunnel tests and calculations on the Saab J-29 and the Draken delta; from those on the latter has come a general study of the flow around delta-shaped plates. One interesting and successful experimental technique has been used to indicate visually the flow over a surface: the model, painted black, is first sprayed with kerosene, and then with slow-drying white lacquer. In the tunnel, the lacquer floats on the kerosene layer, forming white streaks in the direction of flow, and showing the flow over the *whole* of the surface (thus improving on the tuft method, which gives no reliable indication of the flow aft of separation). The method is ideally suited for photographic recording, as an examination of photographs obtained in this way strikingly showed.

For the future, considerable expansion is anticipated; another electronic calculator is now being built, and the Division has a full and varied programme of work. The Institute's *Angtekniska Institutionen* (literally "Steam Technology Division") has an interest in supersonic testing also, for the purposes of gas turbine investigations, and operates four compressed-air intermittent tunnels. Contact between the Institute and Britain and the U.S.A. is continuing with the exchange of post-graduate students from the College of Aeronautics, Cranfield, and from the Massachusetts Institute of Technology.

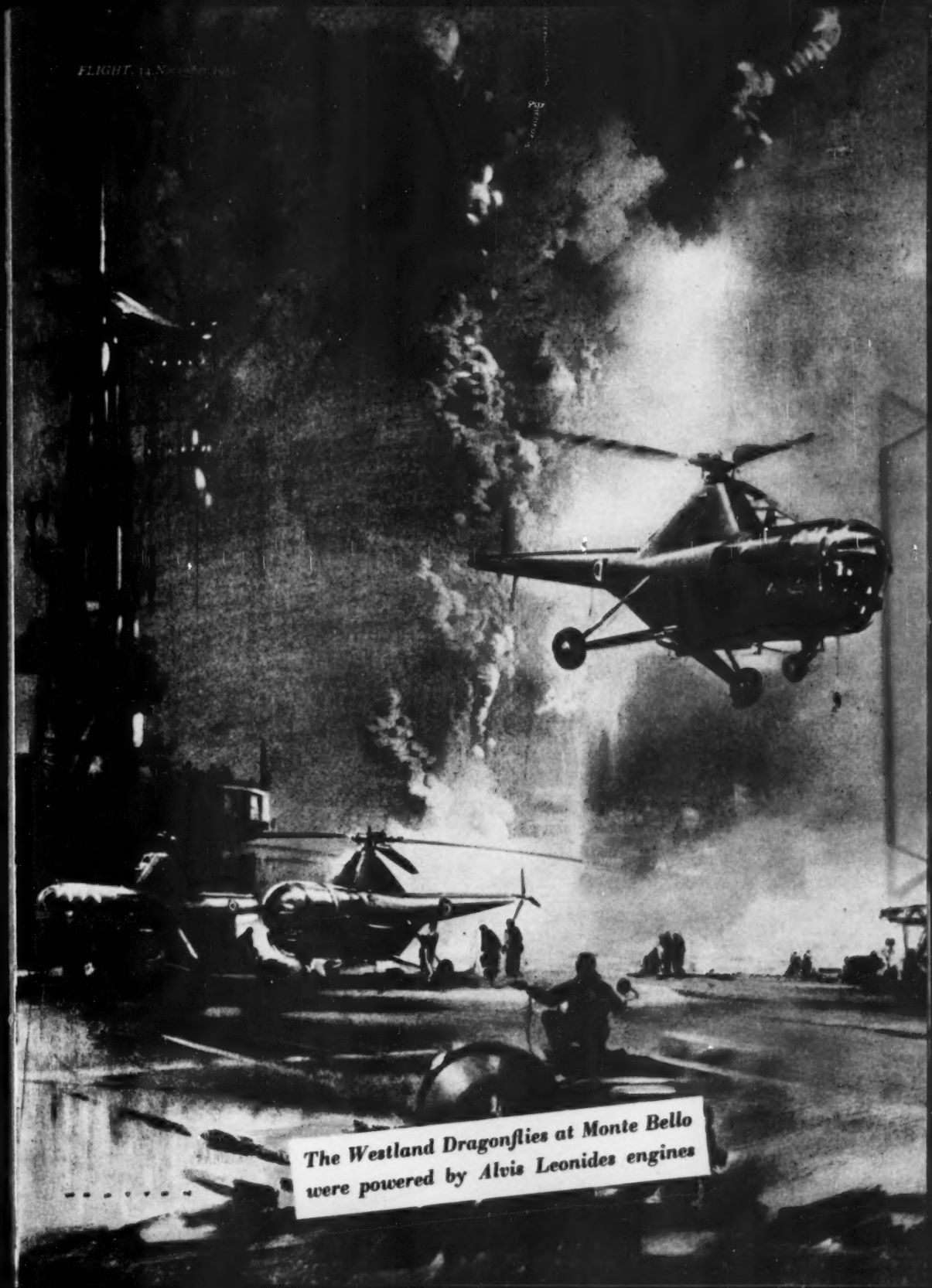
Aeronautical Research Institute

Another important establishment is the government-owned Aeronautical Research Institute at Ulvsunda, near Bromma airport. Opened in 1940, with Professor I. Malmer in charge, the Institute now consists of two main departments, for aerodynamic and structural research respectively, and is headed by Mr. Bo Lundberg.

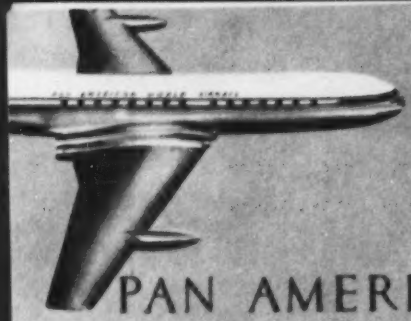
The aerodynamic section has at present three supersonic and two subsonic tunnels, and additional supersonic tunnels are to be completed in the near future. The first to be built, in 1941, was the large low-speed tunnel having a working section diameter of 12ft, and a maximum wind speed of 328ft/sec, produced by a 1,300 h.p. electric motor. In 1945 a high-speed subsonic tunnel was constructed, using the same power, and developing a maximum wind speed of 885ft/sec (M=0.85 approximately) across a working section of 3.3ft diameter. This is reported to be the fastest continuous-flow wind tunnel in Sweden. In conjunction with it, a supersonic tunnel was built in 1946 but was converted in 1948 to a separate supersonic installation comprising three intermittent tunnels. Atmospheric air flows into five large vacuum containers of 8,000 cu ft total capacity, and air velocities up to M=4 can be obtained.

The structures department contains a large experimental hall and many testing machines and rigs. In the hall, complete aircraft and large structural components are tested: much work on several of Saab's military aircraft has been performed here. The test

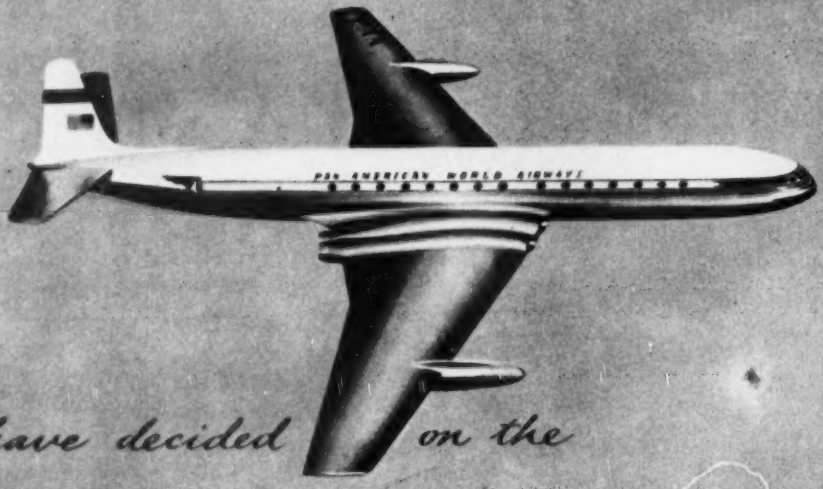
(*Concluded on page* 623)



The Westland Dragonflies at Monte Bello were powered by Alvis Leonides engines



PAN AMERICAN WORLD AIRWAYS



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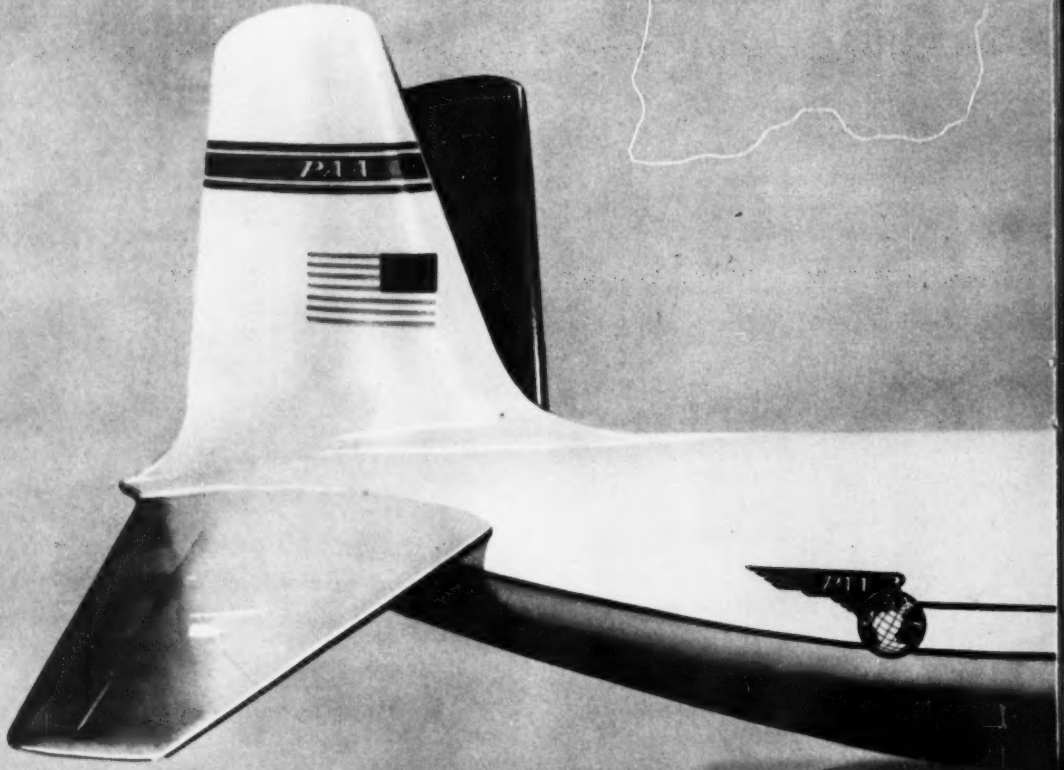
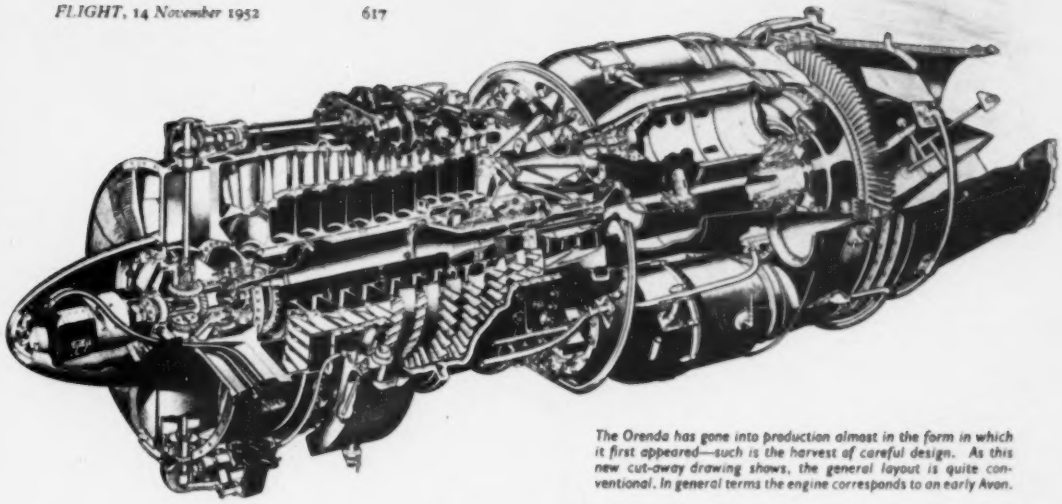
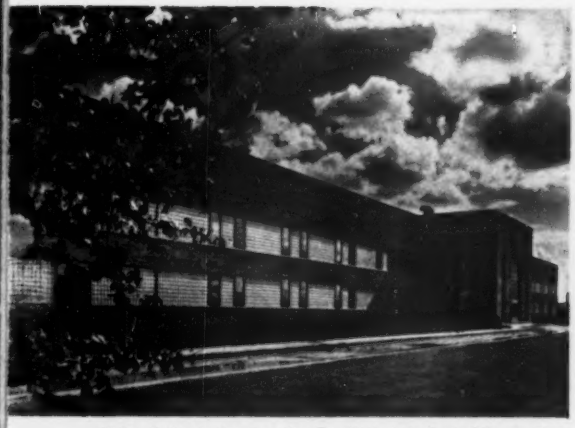




The Orenda has gone into production almost in the form in which it first appeared—such is the harvest of careful design. As this new cut-away drawing shows, the general layout is quite conventional. In general terms the engine corresponds to an early Avon.

"SOURCE OF ALL POWER"

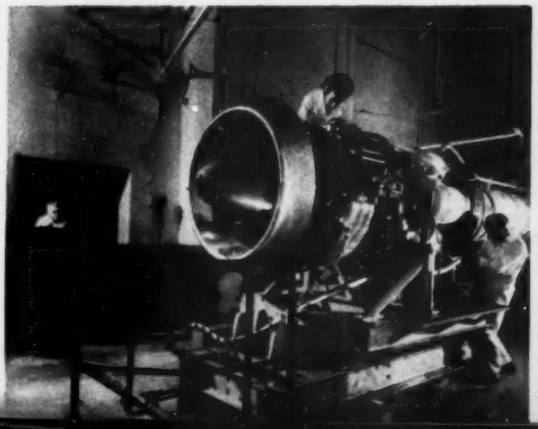


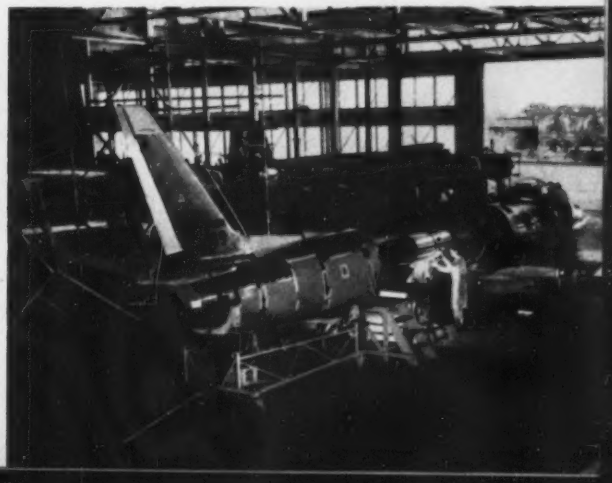
Unlike the production area, the office block at the front of the new plant (above) has windows—two long panels of glass brick.

THE name given by Avro Canada, Ltd., to their powerful production turbojet—Orenda—is an Iroquois word, meaning "the source of all power," which identifies an Indian spirit. But there is nothing mythological about Avro Canada's Orenda, for on September 29th of this year the Rt. Hon. C. D. Howe, Canadian Minister of Defence Production, dedicated the company's new engine plant at Malton, Ontario. The new factory is some 700,000 sq ft in floor area, and the main block follows the modern practice, standard in North America, of being air-conditioned and windowless. Temperature and humidity are kept constant throughout the year, and the total length of fluorescent lighting installed exceeds 13 miles. During the opening ceremony, Mr. Howe gave news of large additional orders for the engine, which is entering very-large-scale production for the Avro Canada CF-100 Canuck and Canadair F-86E Sabre fighters. The Orenda is a "first" in many respects; it is the first all-Canadian engine to go into production; it is the first gas turbine to go into production in Canada; and it is the first product of a completely new, and cosmopolitan, design team (the Chinook experimental engine was designed by an Avro Canada predecessor, Turbo Research, Ltd.).

The Orenda has already shown what it can do installed in this American-built F-86; production engines will power the Canadair F-86E. In the background are two CF-100 fighters—also Orenda powered—and the rudder of the Avro Canada Jetliner appears on the extreme left.

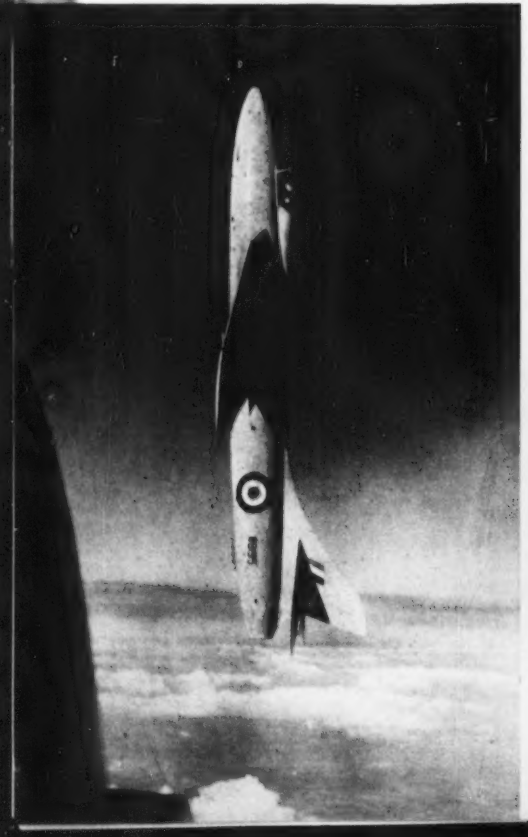
All Orendas are test-run before delivery; this test-cell (below) in the new plant employs floating-type mountings to take the engine's 6,500 lb thrust.

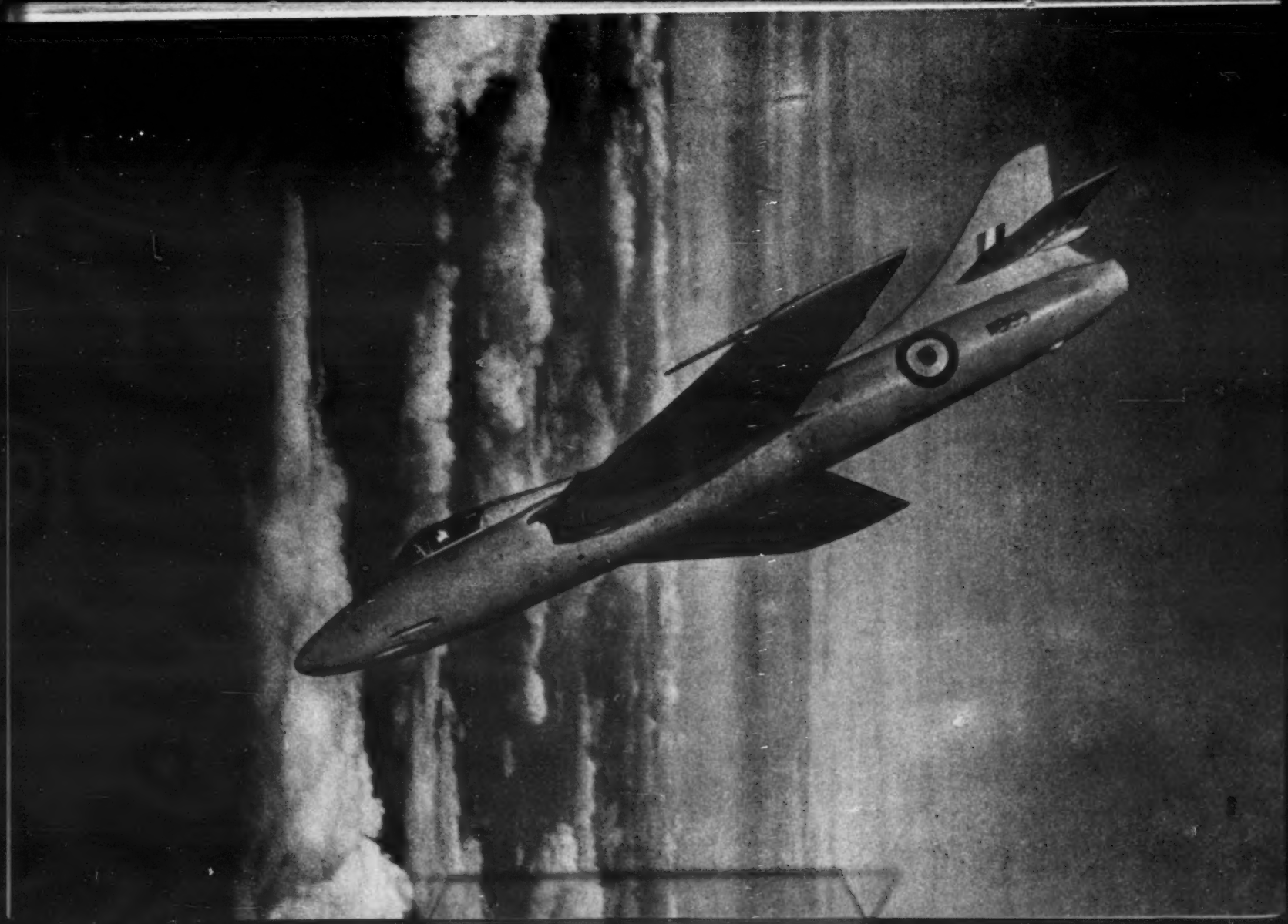




VIEW HALLOO!

PERHAPS the most exhilarating, and at the same time technically remarkable, air-to-air pictures ever published, these of the second Hawker Hunter F.1 prototype interceptor (Rolls-Royce Avon) are the latest examples of the work of Mr. Russell Adams. Mr. Adams was in a Meteor 7 flown by Gloster test pilot Brian Smith, and at the controls of the Hunter was Hawker's chief test pilot, S/L. Neville Duke, D.S.O., D.F.C., A.F.C. The loops which the pictures record were started at a speed of about 460 m.p.h. at 6,000ft, and the two machines rose to about 12,000ft at the top, where the speed had fallen to some 230 m.p.h. The distance between the wing-tips at the start of each loop was about 20ft. In the background of the right-hand view below is the town of Reading. The camera was a 5in × 4in Speed Graphic.





The Commercial Future of Helicopters

REALISTIC ASSESSMENT BY B.E.A.'s CHIEF EXECUTIVE

FEW people are better qualified to discuss the subject of commercial helicopter operations that Mr. Peter Masefield, M.A.(Eng.), Cantab., F.R.Ae.S., M.Inst.T., chief executive of British European Airways. More than any other operator, B.E.A. is responsible for kindling practical interest in the commercial helicopter, sponsoring the construction of suitable machines and gathering operational data. In his lecture ("Thoughts on the Operational Future of the Transport Helicopter") to the Helicopter Association of Great Britain, Mr. Masefield has made another valuable contribution to this vital new study. The lecture, delivered last Friday, at the Royal Aeronautical Society, is summarized below.

DESPITE Mr. Masefield's enthusiasm for the helicopter, his lecture shows no attempt to under-estimate the problems which for some years will undoubtedly beset this relatively new and undeveloped type of aircraft. In fact, his introductory remarks comprise a most objective summing-up of the present abilities of the helicopter. Its take-off and landing characteristics, enabling it to operate successfully from small areas, are [Mr. Masefield admits] at present the helicopter's only outstanding quality, and it has no other advantage for air transport. In its present stage of development it is slow, complex, potentially noisy, expensive to buy and run, has difficult vibration characteristics, and as yet is too small to be economical.

Nevertheless [the Paper continues] after a good deal of study B.E.A. have reached the conclusion that the helicopter is capable of development to a commercial stage during the next decade. In that period, they believe, a large and relatively fast transport helicopter can be produced which will be able to cut down train and air times by more than a half at non-subsidized break-even fares about double those of first-class domestic rail travel today—and on short international services fares comparable with luxury surface travel. The helicopter makes possible important savings in airport costs but these cannot yet be defined with precision because of the impossibility of foreseeing how many—or how large—airports would still be required for longer-range air transport if the helicopter were to take over all air routes up to 250 miles stage distance. In the late 1960s the development of the helicopter might mean that London could be served adequately by only two fixed-wing airports—Heathrow and Gatwick—instead of at least four, which will be necessary if present traffic trends continue.

Present developments in air transport have led to a situation where there are now more than 2,000 major civil airports throughout the world. The capital investment sunk in hard runways and taxi-tracks at these airports probably amounts to not less than £1,000 m. What is more, the average surface-journey time between city centre and airport is not less than 30 minutes—at the present stage of air transport—representing a useless expenditure of about 1 m passenger hours on road conveyance every week.

If a means of vertical take-off and landing had been developed in the early days of air transport, the saving in fixed installations, quite apart from the many intangible advantages, would have been tremendous. As things are, the fixed-wing aeroplane will be with us for many years, continuing to develop in speed, size, economy and safety, but also continuing to require runways of up to 2,000 yd. In the long run, the characteristics of the helicopter and of the jet aeroplane will probably be combined to provide vertical take-off and landing—although whether that will be achieved with rotors is doubtful.

The following analysis confirms the specialized case of highly competitive operations in Europe. Overseas, where greater operating costs are often justified, there already exist manifold opportunities, and the products of the British aircraft industry show up remarkably well.

Even with seats for 40 passengers and a speed of 150 m.p.h., the minimum capacity and speed which can be set for the immediate future, a helicopter will be substantially more expensive to operate than the equivalent fixed-wing aeroplane. Several such machines are in the offing but until one is built which combines the requisite speed and capacity with a reasonable amount of exterior quietness, the major field of activity for the helicopter must lie outside the realm of commercial transport. Although the helicopter has so far reached a stage in scheduled civil passenger transport work not yet equivalent to that achieved by the fixed-wing aeroplane in the 1920s, the passenger helicopter will, during the next 20 years, assume a major rôle, not only in short-haul air transport, but also as a major factor in all forms of transport for all distances between about 50 to 400 miles; but there is as yet no general realization of the amount of work, money and time which is needed before the helicopter can be regarded as a developed and economical vehicle. Design and production of a large, fast helicopter is a major engineering task comparable with that of the Comet or Britannia.

Helicopter development can be seen as evolving in three stages: (1) The present phase of building up experience with small single-rotor machines; (2) An intermediate period with scheduled services by medium-sized multi-engined helicopters (such as the developed Bristol 173, which will be the first types capable of operating safely in built-up areas) but will be severely limited by their economical characteristics; (3) Short- and medium-stage services between city centres with 150-m.p.h., 40-seat helicopters, which are still likely to be more expensive to operate than equivalent fixed-wing types. This third phase, the beginning of the use of the helicopter in its fundamental rôle, cannot begin before 1960 and is likely to be still further delayed.

Operational experience of scheduled helicopter services is so far confined almost entirely to B.E.A. and Sabena in Europe and Los Angeles Airways and Helicopter Air Services in the United States (in addition, the Skyway Corporation operated a scheduled service in Boston, Massachusetts between April and July, 1947, and New York Airways have just started inter-airport mail services in the New York area). B.E.A. operated the world's first regular passenger service—between Cardiff and Liverpool—over the period June 1st, 1950-March 31st, 1951; 1,086 hours were flown and 819 passengers carried. Between June 1st, 1951, and April 5th, 1952, some 809 hours were flown, and 1,166 passengers carried by the Corporation's S-51s on the Birmingham—Northolt—Heathrow route. These are the only serious helicopter passenger services to have been flown for more than a very short period. Using Bell 47s, Sabena have flown about 2,000 hours with mail over a 266-mile circuit with nine intermediate stops. Using, respectively, S-51s and Bell 47s, Los Angeles Airways and Helicopter Air Services have built up a total of some 40,000 flying

(Below) Bristol's twin-engined, twin-rotor Type 173 helicopter (foreground), with its single-engined predecessor, the 171. The smaller machine has already been used for development work by B.E.A., who hope to receive the second prototype Bristol 173 for testing next spring.

"Flight" photograph

"Flight" Photograph

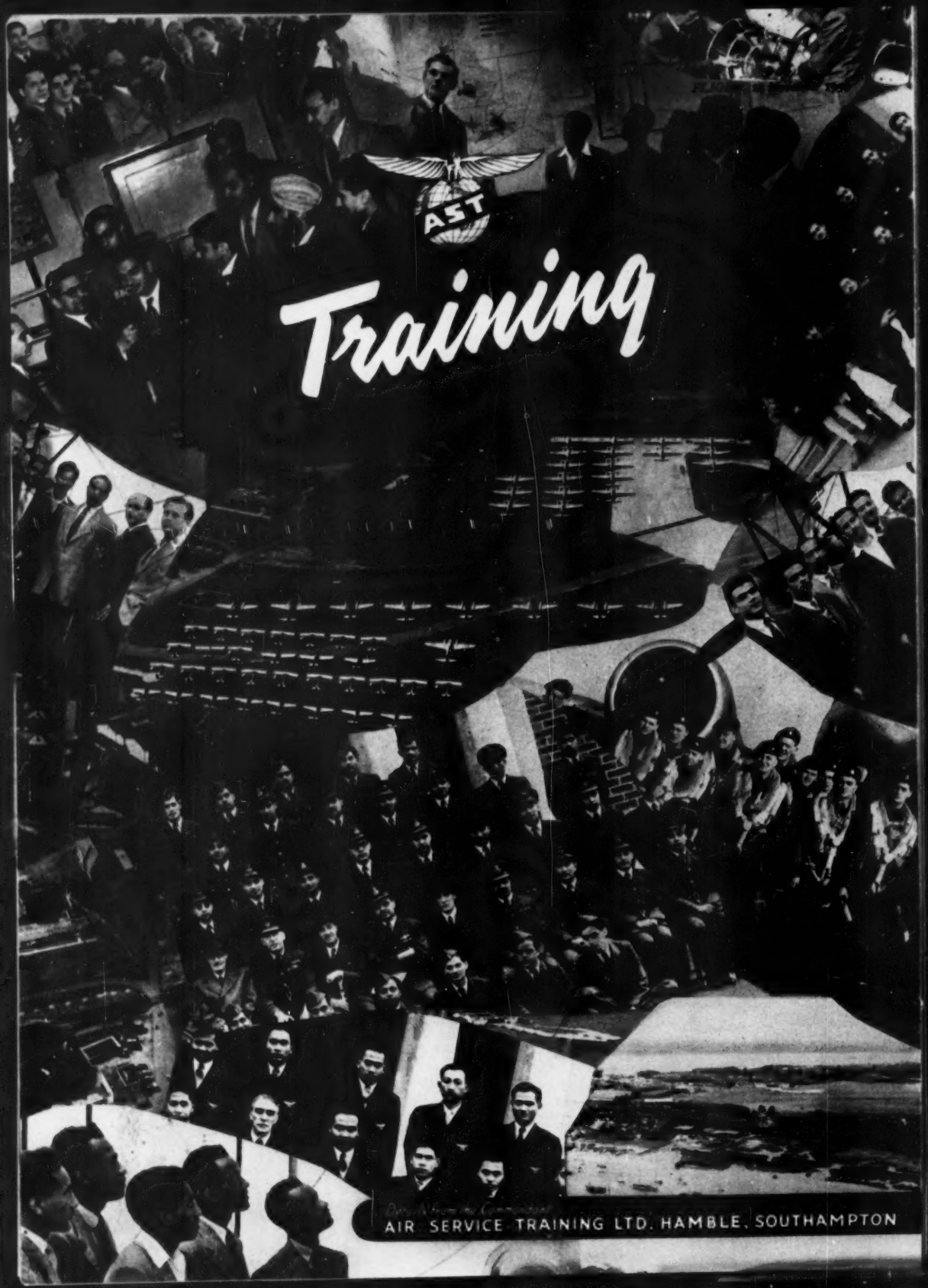
Ejection Seats

In squadron service—the Martin-Baker Patent Ejection Seat is fitted to all high speed aircraft

Martin-Baker

AIRCRAFT COMPANY LTD

HIGHER DENHAM NEAR UXBRIDGE · MIDDLESEX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Training
AIR SERVICE TRAINING LTD. HAMBLE. SOUTHAMPTON

The Commercial Future of Helicopters . . .

hours on short-stage mail services. These operations, with comparatively small single-engined single-rotor machines, do not represent as much as one day's services by the world's airlines, but they have been sufficient to indicate that the helicopter can now be made into a reliable and acceptable—although uneconomic—vehicle for passenger transport over short and medium distances.

What little experience we have must be used as a guide to the soundest possible planning for the future. These plans must state a requirement for the vehicle and try to determine both its method of operation and the pattern over which it can perform its most satisfactory service to the community. [*On this basis, the lecturer then put forward his views, which are presented below in condensed form under their respective subject headings.*]

Broad Requirements.—We should plan to achieve a large multi-engined helicopter capable of cruising at not less than 150 m.p.h. and offering between 40-70 passenger seats by 1960. Such a size should be just sufficient to make the helicopter practical for limited operations and is just within the technical capabilities of today's knowledge. B.E.A. believe that the Bristol 173 could form the basis for a helicopter development from which useful results could be gained. They hope to receive for intensive assessment and testing the second prototype (two 550-h.p. Alvis Leonides) during the spring of 1953, but this early version has not sufficient payload for serious operations. The necessary increase in payload and speed will be found in the developed Mk 3 version (two 870-h.p. Leonides Majors) of which, it is believed, a prototype or pre-production version could be delivered to B.E.A. in the autumn of 1954. By the time a large helicopter was available in the early 1960s production type Mk 3s would have built up some years of scheduled operating experience, including service into city-centre rotorstations. Unfortunately, a need for a full C. of A. and the engine-production position would delay the start of scheduled operations until 1957. The following figures are forecast for Bristol 173 Mk 3: Cruising speed, 115 m.p.h.; capacity, 18 seats over a 115-mile stage; operating cost 9.5 pence per seat mile (although high, this could be tolerated over certain key routes, and if mail contracts were gained passenger fares could be reduced). At present, however, only two 173 prototypes are being produced, plus three non-civil Leonides Major versions—numbers which are quite inadequate for the work which must be put in hand. B.E.A. believe that initial production of 173 Mk 3s will be justified as soon as satisfactory trials are complete—in 1954.

The B.E.A. Specification.—Issued in August, 1951, the B.E.A. specification of requirements for a large helicopter has been the subject of design studies now being prepared by five British manufacturers. Its chief features were as follows:

(1) In its initial form, a requirement to carry 30 passengers (or 7,000 lb of payload) over a stage of 115 miles. In its finally developed form, to carry 35-45 passengers (or 10,000 lb of payload) over a 230-mile stage.

(2) Fuel tankage to permit operation on a 230-mile stage against a 46-m.p.h. headwind.

(3) Both the above to be achieved with fuel reserves for one hour's stand-off.

(4) A commercial cruising speed of at least 138 m.p.h. (120 knots) at 2,000ft using either maximum weak mixture power or 50 per cent METO power, whichever is the lesser.

(5) A vertical rate of climb at sea level and maximum power of at least 600ft/min without ground effect and at zero forward speed.

(6) Cruising speed, with critical engine inoperative, of at least 115 m.p.h. at 5,000ft. Rate of climb at best forward speed with critical engine inoperative, of at least 200ft/min at 5,000ft.

(7) Ability to operate from an area 400ft in diameter, with upstanding obstructions all round, contained below a cone with a slope of one in two from a circle 300ft in diameter centred on the landing area. It should be possible to operate in such a manner that, in the event of engine failure at any stage of the flight, the helicopter can return safely to the take-off point or continue its flight and land elsewhere.

(8) Ability to make an autorotative landing over a 100ft screen within 150 yd.

(9) The importance of safety, mechanical reliability, good stability and handling characteristics and the ability to operate in all weathers were particularly stressed, as was the importance of low operating and engineering cost.

(10) Other features asked for included: ability to permit indiscriminate loading, full dual control, complete instrumentation with all necessary aids to all-weather operation, blade-folding, provision for rapid turn-rounds, low vibration characteristics, air-conditioning in the cabin and low external and internal noise-levels.

The broad characteristics of the specification remain unaltered although requirements have been modified and extended in the course of discussion and developed thinking.

Possible power units for the "BEAline bus" might be two Centaurus, four Hercules, two Proteus turboprops, two Ghost

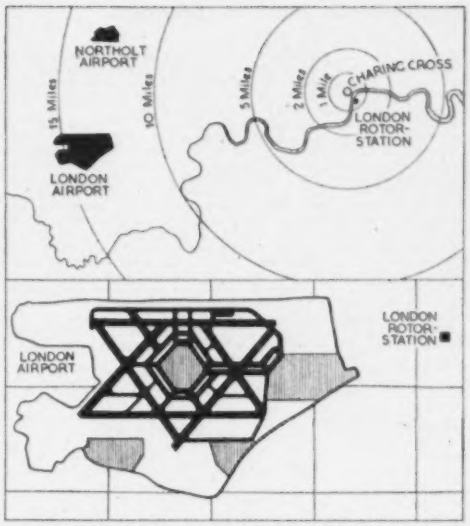


Fig. 1 Advantages of the rotorstation versus the airport: comparisons in terms of distance from city-centre and of area (lower sketch).

Fig. 2. Illustrating unit cost of a 48/64-seat helicopter of 50,000 lb, based on development, jigging and tooling costs totalling £6 m. Twenty aircraft would cost £450,000 each (£9 per lb) but this would shrink to £162,000 if 500 were produced.

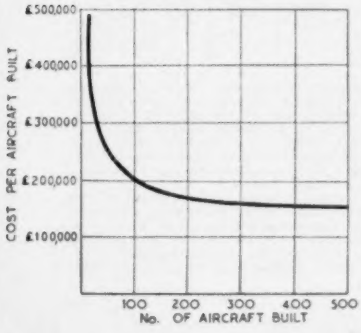


Fig. 3. Aircraft costs per seat-mile at 2,000 hr utilization plotted against stage distances: a comparison between helicopters (including a hypothetical "BEAline bus") and fixed-wing aircraft.

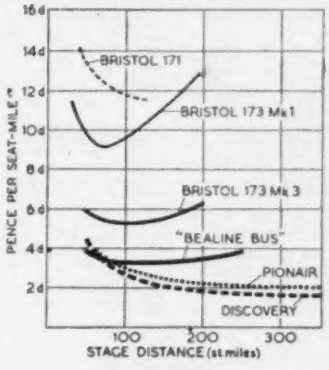
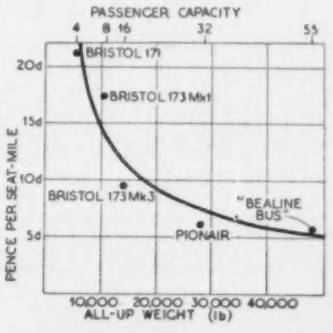


Fig. 4. Total costs per seat-mile versus weight, based on a stage length of 100 miles. The comparison is between estimated costs for the four helicopters and achieved costs for the Pionair. Corresponding cost for the Sikorsky S-51 is 29 pence.

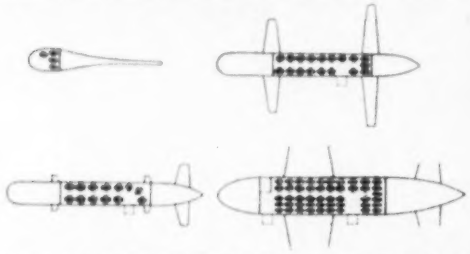


The Commercial Future of Helicopters . . .

turbojets, four Dart turboprops or four Mamba turboprops. Use of turbines might require a pressurized cabin but, even so, this might be dictated by high rates of climb to and descent from moderate heights. However, wind speeds at height and the effects of the blade-tip Mach number and tip stalling might delay the use of turbines.

Ahead of submission of design studies, a reasonable "guesstimate" of the characteristics of a helicopter built to this specification might show a capacity for 64 passengers for such short stages as 25 miles, falling to 48 seats for 250 miles, a gross weight of 48,000 lb, a practical mean cruising speed of 160 m.p.h. and rotor diameter of about 72ft. Some of the projected aircraft would have propellers to attain relatively high forward speed and most would have wings—stub or not-so-stub—to unload the rotor in cruising flight, raise cruising speed and provide stowage space for the undercarriage. They would be required for a variety of roles—such as high density bus, luxury "Silver Wing" type airliners or short-haul freighters. Such a vehicle will command export sales no less widespread than those of the Comet, Britannia or Viscount, and if the United Kingdom fails to make a determined development effort, we may lose the world market for this class of aircraft just as we lost the export market for the transport aeroplane 20 years ago.

An Essential Development Programme.—The fact that the cost of development must be reckoned in millions rather than in hundreds of



Comparison in fuselage capacities of (left) the single-engined Bristol 171 four-seater helicopter and the Bristol 173 13-seater and (right) the "developed" Bristol 173 with stub wings and seats for 18 passengers, and a possible layout for a 48-seat "BEAline bus."

thousands of pounds is illustrated by the following estimated figures:—

(a) Two prototypes at £40 per lb gross weight ...	£2,000,000
(b) One additional pre-production aircraft at £8 per lb	£400,000
(c) Engine and transmission development ...	£1,500,000
(d) Ground test rigs and running	£300,000
(e) 3,000 hours of flight testing (less revenue) ...	£300,000
Total cost up to start of production ...	£4,500,000

If jigging and tooling costs of at least £1.5m are added to the cost of development, production runs of various numbers of 50,000 lb helicopters would involve the unit costs plotted in Figure 2.

My personal belief [said the lecturer] is that if the large helicopter came up to the performance estimated not less than 200 would be sold;

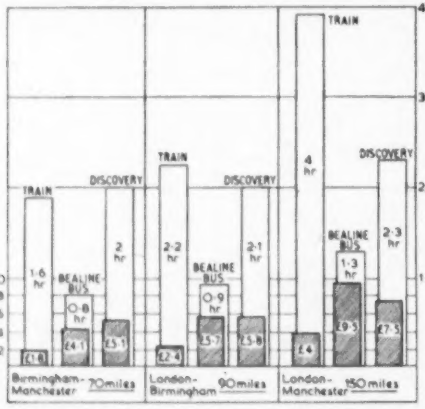


Fig. 5. Comparison, on the basis of times taken and fares charged, between helicopter, aeroplane and train over three important domestic routes. Fares assumed in each case are: train, first-class return (1952); helicopter and aeroplane, estimated break-even return.

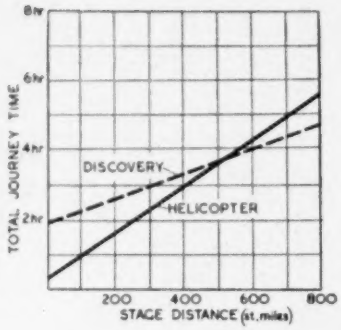


Fig. 6. Discovery versus "BEAline bus": comparison between total journey times between city-centres, plotted against various stage distances. A speed of 291 m.p.h. is assumed for the Discovery and of 160 m.p.h. for the helicopter, an allowance being made in each case for a head-wind component of 10 m.p.h

at £180,000 each, they would be competitive with fixed-wing aeroplanes of similar gross weight. A programme of that sort would mean a capital outlay of about £21 m spread over 10 years or so to bring 100 aircraft into airline service—money which could be recovered provided the machine was a success (as could be determined relatively early in the programme). Such a project requires the fullest possible Government support—not at present obvious.

Cost estimates have been made by B.E.A. for four helicopter developments which are compared in the following table with the 32-passenger Pionair; in each instance the figures are for "aircraft type costs." To arrive at the operators' total costs 80 per cent is added in the case of the Bristol 171 and 173 Mks 1 and 3, 70 per cent in that of the "BEAline bus" and 100 per cent in that of the Pionair (on the basis of costs achieved at present). Such costs do not necessarily give a complete picture of the comparative economics of the helicopter and the aeroplane; although, for example, the respective costs of control facilities and navigational aids are likely to be similar, the cost of rotorstations will be much less than that of building airports. This factor, the main intangible, might more than outweigh the development costs of the large helicopter.

	Bristol 171 (1952)	Bristol 173 Mk 1 (1953)	Bristol 173 Mk 3 (1955)	BEAline Bus (1960)	B.E.A. Pionair DC.3 (1951)
1. Basic annual costs (per annum)	£6,660	£13,170	£16,400	£43,800	£6,150
2. Hourly cruising costs (per flying hour) ...	£11.95	£21.60	£26.35	£62.20	£33.50
3. Take-off and landing costs (per landing) ...	£1.00	£2.10	£2.40	£8.00	£9.30
Assumed power plant	One Leonides	Two Leonides	Two Leonides Major	Two Turbines	Two Twin Wasp
Gross weight (lb) ...	5,300	10,600	14,000	48,000	28,000
Rotor diameter (ft)	48.3	48.3	48.3	72	—
Commercial cruising speed (m.p.h.) ...	92	104	115	160	167
Assumed passenger seating capacity ...	4	10	18	48/64	32
Assumed revenue utilization (hours per annum) ...	2,000	2,000	2,000	2,000	2,000
"A" cost per aircraft-mile at:—					
50 statute miles ...	4.48s	7.64s	8.82s	19.64s	11.95s
100 " " ...	3.94s	6.54s	7.34s	15.41s	7.95s
200 " " ...	—	—	6.75s	13.32s	6.38s
300 " " ...	—	—	—	—	5.70s
400 " " ...	—	—	—	—	5.44s
500 " " ...	—	—	—	—	5.17s
"A" cost per available seat-mile at:—					
50 statute miles ...	13.40d	9.75d	5.88d	3.87d	4.48d
100 " " ...	11.80d	9.62d	5.30d	3.36d	3.02d
200 " " ...	—	—	6.34d	3.54d	2.39d
300 " " ...	—	—	—	—	2.14d
400 " " ...	—	—	—	—	2.08d
500 " " ...	—	—	—	—	2.07d

Figure 3, in which these estimated type costs per seat mile are plotted against stage lengths, shows that even the "BEAline bus," with its 68-74 seats, does not achieve such low costs as the 32-passenger Pionair, except on very short stages, leaving out of the account potential savings of aerodrome costs. To achieve comparable seat-mile costs a still larger and faster helicopter would be required—and that may be beyond the practical possibility of the time. Although some 60 per cent more expensive per seat-mile than the Pionair, the developed Bristol 173 (at 9.5 pence per seat mile) will be worth operating commercially on a limited scale—over routes where its characteristics offer competitive advantage, or where possible savings in aerodrome costs would warrant higher airline costs (such as in Scotland by about 1958). By plotting cost per seat-mile against gross weight (Fig. 4) it can be seen that on present trends a total seat-mile cost of 4 pence cannot be gained until we produce a 100-seat

helicopter weighing some 80,000 lb. The trend shown by these figures is that unsubsidized helicopter fares will be possible in the next decade on only very short stages where the aeroplane serves no useful purpose. Some break-even return fares on U.K. domestic routes, based on a load factor of 75 per cent, are shown in Fig. 5.

On the basis of these figures the "BEAline bus" may well find its most favourable application on international short-haul services; cheap tourist travel is left to the fixed-wing machine and the higher break-even fares of the helicopter must be judged against its luxury characteristics and its saving in time.

The Importance of Speed.—The problems of drag, power, rotor-blade stalling and possible vibration will set an economical limit on the cruising speed of the helicopter in the next decade, but too slow a speed means that the vehicle cannot maintain punctuality or regularity against moderate head-winds, and there is a lower economical limit of about 150 m.p.h. As seen in Fig. 6, a 160 m.p.h. "BEAline bus" proves faster than the 290 m.p.h. Discovery between city-centres up to a distance of 500 miles and can achieve the same journey time over 600 miles. Unfortunately, however, the 160 m.p.h. 48-64 passenger helicopter will be too expensive to operate commercially beyond about 250 miles.

An Operational "Guesstimate".—The hypothetical route networ shown in Fig. 7 shows what could be achieved with a large helicopter having the following characteristics: capacity, 48 seats for 250 miles, 64 seats for 25 miles; cruising speed, 160 m.p.h. (with margin for keeping schedule against head winds); gross weight, 48,000 lb; rotor diameter, 72ft. Its cost over an optimum stage of 120 miles would be about 5.56 pence per seat mile, rising to 6.56 at 250 miles.

On all but the three major domestic routes (London to Edinburgh and Glasgow and Belfast, where the fast turbo-liner would still show advantages in city-centre journey speed and cost), this helicopter would replace fixed-wing aircraft. At a 75 per cent load-factor, the break-even fare necessary on the London-Amsterdam stage would be about £15 4s. —rather less than today's standard air fare and comparable with the first-class return rail fare of £11 19s. The helicopter would, however, take only 1 hr 48 min between city centres, compared with 2 hr 48 min by Discovery and 11 hr 10 min by train and steamer (so that its time saved in service transport could be priced at 3s. 6d. an hour). On such a network the primary rôle of the transport helicopter is to operate directly between traffic centres. Helicopter taxi services over very short stages, such as between airports and city-centres, is not likely to prove practical; such an operation between London Airport and Waterloo Air Terminal would require a single fare of about 16s—which is not likely to prove attractive. But a number of stops might be made at major airports to set down and pick up interline traffic.

Operating Standards.—A backward take-off at an angle of about 40 deg may well prove to be most satisfactory. It enables the pilot to keep his alighting area in view all the time and if an engine fails below the critical safety height he can reverse direction and alight safely. At or above safety height the backwards ascent would be translated into a normal climb on course, and if an engine failed the pilot would fly to a convenient airport and probably make a runway landing. In the interests of economy, the ability to hover with one engine out is probably best eliminated.

The problem of landing at a rotorstation in low visibility and the *en route* performance required to clear specific obstacles will also influence single-engined performance requirements. In low visibility it is possible that: (a) no helicopter will be allowed to continue an approach below critical height unless the landing area is visible from that height; and (b) there may be a requirement for operations at a lower gross weight than in V.F.R. conditions, thereby improving engine out performance. In the *en route* case, the obvious requirement is the ability to clear the highest point with an adequate safety margin after engine failure. In certain circumstances this may limit the safe all-up weight and have a greater influence than the requirements for take-off and low-visibility landings. Despite suggestions to the contrary, fuel reserves will be necessary—to combat unexpected head-winds, to enable the helicopter to "hold" in the landing pattern or divert to an alternative landing point, and to meet increased consumption such as may occur after engine failure with turbine power plants. The suggestion that a helicopter should merely pop down at any convenient point and wait its turn to come into the rotorstation is not realistic; in low visibility at night it will be almost as dependent on aids as an aeroplane, and a blind descent into an open field (possibly laced with high-tension cables) is not really a practical proposition.

Quick Stops.—Short turn-round and transit times at rotorstations will be vital for three reasons: rotorstations are by their nature of restricted area; helicopter services, being short-haul, will be of high frequency, with the consequent risk of air traffic control saturation; utilization will have to be high for economic operation. Design for quick exit and entry of passengers, loading and refuelling will thus be essential.

Noise.—This problem must be taken seriously, for if the helicopter were banished from city-centres because of noise its whole advantage would be lost, and the money required for its development would be more usefully spent on improving the fixed-wing aeroplane. The maximum amount of silencing tolerable from the payload viewpoint must come from the detailed design of the aircraft; the stub wing, for example, can assist in acting as an exhaust blanket. The rooftop site will help to keep the noise from street level and a parabolic-shaped "crash barrier" around the site will reflect some of the noise. Steep and rapid climbs and descents can also do much towards reducing the menace.

Rotorstations will require the following qualities: proximity to the city centre; rooftop situation to avoid turbulence, save landing and reduce noise; built-in refuelling points; alighting area of not less than 400 sq ft; incorporation of airways offices, town terminal and elevated garage (a rebuilt Waterloo Air Terminal would be the ideal rotorstation for London); a roof not strengthened significantly, but rendered impervious to petrol and oil (the cost of fitting the roof of a new building for helicopters has been estimated at less than £1 per sq yd, or about £17,000 for a roof of the required size).

Conclusions.—The lecturer summed up as follows:—

(1) The helicopter has a vital part to play in world communications

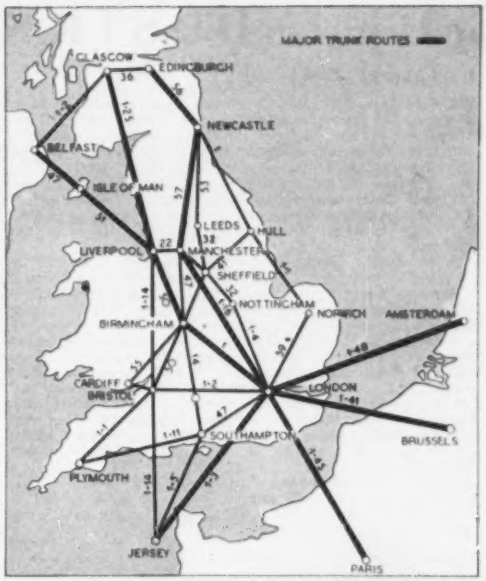


Fig. 7. Hypothetical network of internal and short stage European routes as operated by a 160-m.p.h. B.E.A. helicopter with 48 seats. Figures represent journey time for each route in hours and/or minutes.

if it can be made large enough, fast enough, and quiet enough—and hence economic and acceptable in operation.

(2) The objective to make possible economic results in the next decade must be a speed of not less than 150 m.p.h. and a capacity of not less than 40 seats. More speed and more seats are highly desirable to cut costs.

(3) A 160-m.p.h. helicopter with 48/64 passenger seats should be capable of being produced by 1960 on the basis of technical progress which can be forecast today. Its development will be dependent on large-scale Government support—of which, as yet, there is little evidence.

(4) One hundred such aircraft would cost about £20,000 each and have a total operating cost of about 5½ pence per seat mile for an optimum stage distance of about 120 miles. That means a fare of about £4 for a journey of 120 miles in order to cover all costs at a 75 per cent load factor.

(5) If a 48/64-passenger "BEAline bus" helicopter is produced during the next eight years, it will be able to provide important improvements in short-haul transport at costs to the operator—and hence at passenger fares—consistent with the level of service offered.

(6) The field of use of the transport helicopter in the next decade will be up to a stage distance of about 250 miles. At the longer stages the helicopter could provide international luxury services at fares on a level with those of luxury surface transport although higher than those of the fixed-wing aeroplane. The helicopter will be able to cut about an hour off aeroplane journey-times between city-centres 250 miles apart.

(7) When potential savings in capital expenditure at new airports are taken into account, the development of the large helicopter may well prove to be a most valuable national investment.

(8) To be effective the commercial helicopter must operate into city centres. If it is banned from city centres because of noise most of the case for the transport helicopter falls to the ground.

SWEDISH AERONAUTICAL RESEARCH

(*continued from page 616*)

equipment includes a 10-ton, 13-ft. stroke drop-hammer (used for under-carriage tests), high-temperature creep-testing machines (for turbine-blade material testing), fatigue-testing machines and static-load testing machines. Two auxiliary sections are the physical department, which designs measuring apparatus for the two main departments; and the workshop section, which constructs the wind-tunnel models and other equipment.

Much expansion work is at present taking place at the Institute. Future plans on the aerodynamic side are mainly concerned with investigations in the transonic speed ranges (M = 0.7 to 1.5), and with approaching the critical aerodynamic conditions at M = 1 from both above and below. A first step is the alteration of the existing high-speed tunnel to increase its application in the lower transonic range (M = 0.7 to 0.98), followed by the construction of an intermittent installation comprising a large supersonic tunnel (working section area, 10 sq ft) and four smaller supersonic tunnels. The vacuum system is again to be employed. This expansion of facilities for aeronautical research is bound to have a great effect on the value of both the published reports of the Institute and of its confidential work for the Royal Swedish Air Force.

THE INDUSTRY

Brought to Light

FOR the past few years the physics research group of Manchester Oil Refinery, Ltd. (Twining Road, Trafford Park, Manchester 17) have been developing non-destructive systems of detecting flaws in metals. Concentrating on the magnetic method, they have produced two effective test-fluids—"Supramor," for the detection of surface flaws in magnetizable metals, and "Glomor" fluorescent ink, for the indication of surface cracks and porosity in both ferrous and non-ferrous (including plastic) materials; the use of "Glomor" was described in *Flight* of June 13th last.

Now a third product has been introduced, under the name of "Lumor" fluorescent magnetic ink. Consisting of a suspension of fluorescent magnetic material in a special liquid medium, it is simple to use; the liquid is applied to the test-piece by pouring from a non-magnetic ladle, by brushing, or by dipping.

The test-piece is magnetized either by the current-flow method (with the aid of a low-voltage, high-current transformer) or by magnetic flux, using a permanent magnet, electro-magnet or magnetizing coil. Surface cracks and internal flaws are then revealed by the appearance of a green fluorescent pattern. This trace is clearly visible by ordinary lighting, but the most effective results, giving a brilliant green pattern, are achieved by the use of an ultra-violet light-source in conjunction with a black glass filter.

The new fluid is being produced in two grades; "Lumor K" has a petroleum base, while "Lumor S" has a non-petroleum base, is odourless, and can be safely used on rubber-bonded steel or cast iron without affecting the rubber.

Prizes for Apprentices

PRINCIPAL guests at the annual prize-giving to Handley Page apprentices, held at Cricklewood on October 27th, were Mr. A. R. Low, Parliamentary Secretary to the Ministry of Supply, who presented the prizes and diplomas, and Dr. J. E. Richardson, head of Northampton Polytechnic.

Sir Frederick Handley Page, in welcoming parents to the prize-giving, reviewed the year's work and spoke of the great prospects in the aircraft industry. Giving news of ex-apprentices, he recalled that, among several serving with the R.A.F., D. Peckham, twice a prize-winner during his apprenticeship, had been awarded a gold vase as the best pilot officer of his course, together with a plaque for the highest marking ever achieved.

Mr. Low spoke of advances in science and technology, which brought with them an ever-increasing demand for skilled men; Handley Page, Ltd., in particular, was engaged on projects of enormous importance to the future of both the R.A.F. and civil aviation.

Dr. Richardson referred to the long association between the company and the Northampton Polytechnic, where a long and expensive programme of extensions would increase facilities. He hoped that establishments like the Polytechnic would enable Britain to apply the ideas which, unfortunately, we often exported for exploitation abroad.

The following apprentices were presented with prizes :—

Technical.—S. Lennox, W. Napthine, D. Hyde, R. Ayers, J. Rudeforth, D. Huggett and D. Lennard.

Trade.—R. Smith, S. Smith, M. Baker, D. McIvor and C. Bainbridge.

Plessey Appointments

ANNOUNCED by the Plessey Co., Ltd., is the appointment of Mr. J. L. Furner as sales manager telecommunications division. He succeeds A. Cdre. T. P. Fagan, whose new post, in turn, entails liaison with foreign Governments and Government departments on behalf of the company. Mr. Furner was with Mullard, Ltd., for 26 years, in the last three of which he was a member of their communications and industrial valve division.

He also served for a period of some six years in the Royal Air Force, during which time he was in command of radar stations in various parts of the country.

Mr. J. L. Furner, appointed as telecommunications sales manager to the Plessey Co., Ltd.

PROTEUS COMPRESSOR interests A.V-M. Sir Robert George (left), Governor-Designate of South Australia, during a recent visit to the Bristol Aeroplane Company's works. With him is Mr. A. E. Eustace (sales department, engine division).

IN BRIEF

AT a recent meeting of the board of directors of Rolls-Royce, Ltd., it was resolved to pay an interim dividend at the rate of 5 per cent, less income tax, in respect of the year ending December 31st next.

* * *

It is announced that Mr. W. L. Tregoning has been appointed a director of Western Manufacturing (Reading), Ltd., the manufacturers of actuators and associated equipment.

* * *

Forthcoming and current special issues of Iliffe journals covering the transport field include the "British Design for 1953" number of *Bus and Coach* (November 19th) and two Earls Court Show numbers of *The Motor Cycle* (November 13th and 20th—show guide and report respectively).

* * *

In *Flight* of October 24th we briefly described the ground starter units to be produced jointly by Crompton Parkinson, Ltd., and Auto Diesels, Ltd. The latter company inform us that enquiries concerning these units should be made to their works at Uxbridge, Middlesex (Uxbridge 1444).

* * *

Leaflets from Steralic Filters, Ltd., Beaconsfield, Bucks, describe the company's water-filters for laboratory, photographic, and other purposes. Another "Steralic" speciality, and one with obvious aviation possibilities, is a protectively sealed carafe, of 1 pt capacity, for the safe carriage of filtered drinking-water.

* * *

Dowty Equipment, Ltd., announce a record consolidated-profit figure of £560,011 for the year ended March 31st last, as against £430,186 for the previous year. After tax deduction, and provision for loss on the sale of Government securities, net profit is £205,768 as compared with £182,298. A final dividend of 10 per cent tax free brings the total distribution on the Ordinary capital to 20 per cent tax free.

* * *

Mr. R. W. Sutton has recently returned from a tour of Canada in connection with his business—R. W. Sutton (Consultants), Ltd., 7 Lansdowne Place, Cheltenham. The firm is mainly engaged in advising companies on the possibilities of establishing factories in Canada, and assisting in the location of sites and the execution of the necessary dollar-release and other formalities. Mr. Sutton was a director of Hawker Aircraft, Ltd., from 1934 until 1941, and was subsequently on the boards of Dowty Equipment, Ltd., and its subsidiaries.

* * *

Mr. L. Atherton, B.Sc., A.M.I.E.E., has recently joined the Equipment Division of Mullard, Ltd., to take charge of a production group specialising in ultrasonic equipment and laboratory and industrial applications of electronic techniques. During war service with the R.A.F. Mr. Atherton was seconded to T.R.E. at Great Malvern for work on Döppler applications of radar, and he was also at one time in charge of the installation of aircraft beam approach systems in South Africa. Latterly he has been engaged on atomic-energy work with the Ministry of Supply. Mr. A. E. Crawford, A.R.Ae.S., also of the Equipment Division, is now in charge of a special assignment to investigate applications of ultrasonic and other electronic equipment.

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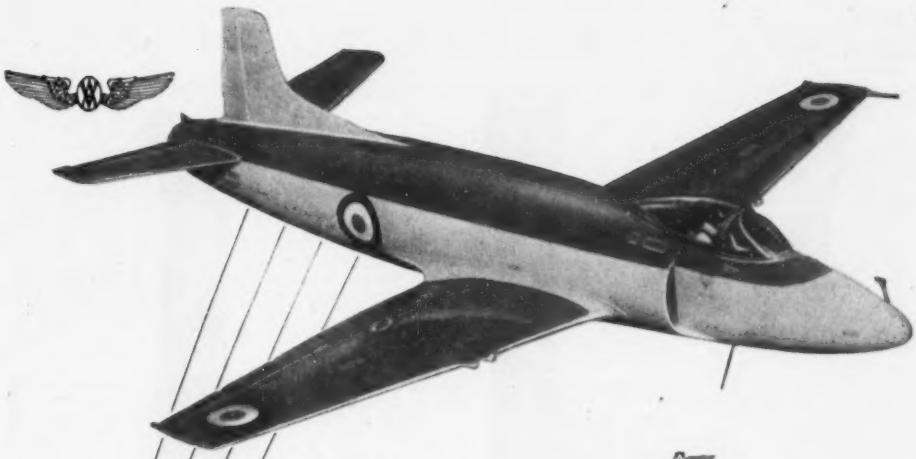

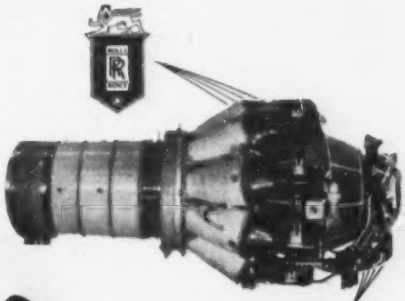

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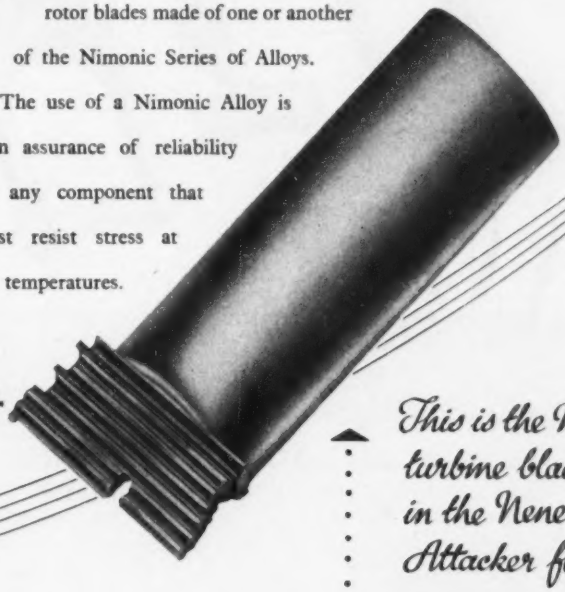

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AVIATION and the EMPIRE

Air League's Timely Advice on Exploiting Commonwealth Resources

MOST readers will support the Air League's belief that "there is one outstanding argument for the utmost possible utilization of aviation in exploiting the resources of undeveloped territories—the speed at which it works and the time which it can save." This contention is illustrated by an appendix to the Air League memorandum on Colonial development; it quotes the following statement, made last August by the Hon. Joseph Smallwood, Prime Minister of Newfoundland, during a visit to this country: "What is wanted is a new Hudson's Bay Company (founded 1670), a modern East India Company (1600), not to trade, not to buy and sell, but just to develop the vast resources of this last and greatest storehouse of Empire wealth. If Britain doesn't pile in and do it, with the knowledge that centuries of pioneering have perfected, another country will. And you don't need 78 guesses to say which country that will be!" Mr. Smallwood, who first brought this idea to Britain in 1951, returned this year with one big concession already granted—to an American company, of which he declared: "They built their 365-mile rail track to the iron-ore mine they leased, and every foot of rail was carried up by air. It was the biggest lift since Berlin. The prospecting was done by air—hoverplane—and as much work was done in a month as used to be done by the old pick-and-shovel boys in five years. That's the kind of action we want! No dead-man developers who buy concessions and leave the country idle. We want the men and the machinery on the spot, and we want them fast."

FOUR aspects of Colonial development in which aviation can play a part are discussed in a memorandum prepared by the Air League of the British Empire for distribution to Ministers, to the Members of both Houses of Parliament, and the Governors and Legislative Councils of the Colonies. Although the memorandum acknowledges the value of the work already done by Colonial governments, by mining and other companies, and also by the Colonial Survey Directorate, it emphasizes the magnitude of what still remains to be done and the special way in which aviation can help. It observes that the Colonial Office has no adviser on aviation, "which seems in this air age to be an omission which calls for some consideration."

Map-making is considered first, as each problem of development demands its own sort of maps. In most kinds of mapping, states the memorandum, air photography gives the greatest return in efficiency and saving of time. Its great advantage is flexibility. A photograph taken on a modern fine-grain film can be enlarged over and over again, not only with increased visibility of detail but without loss of accuracy. The successively enlarged sets of photographs can be used for all the stages of a project after only one flight over the ground. A stationer's shop can supply a map showing in intricate detail any given area in this country; nevertheless for the greater part of the world not even a one-inch map exists, and for vast areas there is nothing more than what can be seen in a good atlas.

Agricultural Improvement.—In this matter the aeroplane can be of the greatest help. It has tremendous scope in the extension of crop preservation by spraying; from the air it is possible to attack a wide variety of damaging and dangerous pests. It is being done in Australia, for example, against rabbits and dingoes. In Africa it has been found possible to kill more than 99 per cent of the tsetse fly and to trace regions affected by the malignant swollen-shoot disease. Low soil-fertility, which prevails over vast areas, can be improved cheaply by aerial fertilization.

Developments in Australia and New Zealand point the way to similar initiative in the Colonies. In New South Wales, for example, there is a scheme by which farm airstrips are licensed by the Department of Civil Aviation and the owners are given an annual grant for keeping them mown and in good repair. Part of the cost is defrayed by using the strips to grow better grass for seed, which is in demand in other countries. Commercial operators contribute by delivering or collecting farm freight or passengers wherever landing strips are available, thereby reducing the cost of farm products and supplies, and saving a great deal of time. In New Zealand, 24 companies are employing 100 aeroplanes on agricultural work. One aspect of their work, fertilization, increased almost threefold in 1951 (by comparison with the previous year), when 168 million lb were distributed over 687,000 acres. The Dominions have led the way and there is a need in Colonial territories for more Government-sponsored activities of this kind; since such services operate to increase the wealth of the communities concerned, they should surely be regarded as an investment.

Surveying from the Air.—The value of the aeroplane, says the memorandum, is underlined by the fact that vast areas of the Colonial territories, including the greater part of Africa, are still, from the economical development point of view, partly unexplored, and much of them completely unmapped. Aerial survey makes it possible to pick out areas containing a higher proportion of first-class arable land or, where arable land exists, sites more suitable for pastoral purposes; it can also assist selection of areas to be protected in the interest of future water supplies. Uganda, Kenya and the West Coast of Africa are examples of territories potentially suitable for agricultural development, but the provision of photographic maps and plans is an essential preliminary. Even greater are the possibilities for Colonial photographic and geophysical surveys for minerals, particularly base metals. While the world is consuming known ore-reserves much quicker than new sources are being found, huge undiscovered deposits are known to exist in Africa—but until they have been tabulated and inventoried there is no possibility of raising capital to exploit them.

The memorandum mentions "almost revolutionary" aerial prospecting methods developed in North America during the last five years: the airborne magnetometer, for detecting radio-activity, and the airborne radio-magnetic methods, for studying conductivity and thus indicating likely deposits of minerals (or, by a process of elimination, the most likely places for water). These devices, which will be available in this country before long, make it possible for the first time to carry out adequate geological mapping of 95 per cent of the world's surface which does not outcrop. These improvements are not yet fully appreciated outside North America, where they have made possible some remarkable findings during the last few years. The memorandum points out that most of the large American mining companies will not now enter an area without employing these means of survey.

Transport.—The lack of transport is holding up economic and social development and leading to serious losses in many parts of the Colonial empire. Instances can be found in all parts, but it is in Africa that "tremendous possibility" exists, with East, West and Central regions crying out for transport which existing railways are unable to supply. In Tanganyika, for example, the Colonial Development Corporation has proved the existence of 40 million tons of extractable coal which cannot be won until 400 miles of railways have been built to carry the coal to the coast. It certainly seems pertinent, comments the memorandum, to ask whether the work of installing the shafts and installing all the machinery need wait until that railway has been built. In Canada, Australia and South Africa it has often proved profitable to fly the machinery and supplies to open-up new mines—for, on at least one occasion, only a little more than half the cost of surface transport.

The memorandum emphasizes two important facts about air transport in relation to undeveloped countries: first, that almost every day it proves possible to carry by air commodities hitherto regarded as outside the ambit of air carriage—as cheaply and, to an increasing extent, more cheaply, than by surface transport; the second great advantage of air transport is that it is virtually independent of the nature of the country over which the service is to be built up.

These projects, it is suggested, might profitably absorb some of the funds allocated by the Colonial Development and Welfare Acts of 1945 and 1950. These Acts, which allowed for the expenditure of some £140m over a period ending in 1956 is, despite a certain amount of assistance from America, at present the principal source of funds for Colonial development. While the whole of this sum has been allocated, the memorandum observes, more than half of it will not have been spent by 1956, owing to shortages of steel, delays in delivery of imported machinery and by restrictions on imports from non-sterling areas. Such difficulties do not apply to the four means of development outlined by the Air League.

It is further suggested that part of the frozen funds might be used to form an "Air Transport Command for the Colonies." Aircraft purchased on this basis could be operated and managed for a fee by independent companies, and put to work wherever the Colonial Office would decide there was need for them—or where any Colonial government wished to hire them.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Historic Delta

IN the October 24th issue of *Flight* Mr. Dennis M. Powell writes of an American aeroplane of 1929 which had dart-shaped wings. But "The Last Laugh" was not first by any means.

Even if one ignores the highly improbable machine designed and built in 1909 by a major in the Native Cavalry at Roorkee, India—illustrated on page 543 of *The Aero*, December 28th, 1909—there is no escaping the remarkable machine illustrated on page 99 of that same journal's issue of August 3rd, 1910 [reproduced herewith.—ED.]. It is a true dart shape with the addition of a tail of sorts, and the politely sceptical caption to the illustration runs "A freak French machine made by Langé and Billard on the lines of the 'dart' of one's schooldays. The inventors hope that it may fly."

Birmingham, 32. J. M. BRUCE.

The "paper dart" of 1909, referred to in the letter, at left, from Mr. J. M. Bruce.

Not-so-feasible Flying Saucer

MY ignorance of farming and Mr. Lockington Bates's ignorance of helicopters (Correspondence, October 31st) should create some understanding between us, but I have a few misgivings over a colleague who can read such an informative paper as *Flight* (from the age of eight) and then design a single-rotor helicopter without cyclic feathering or flapping of any kind. In fact, I suspect he only looks at the pictures—I read the captions as well, and feel I ought to ask Mr. Lockington Bates to put aside his envelopes and blotting pad for the time being, and turn back to *Flight* of January 8th, 1948.

On page 28 he will find a photo of Cierva's C.2 Autogiro, and I should like him to compare this with his design and also to read the caption, which says, "In the C.2 the rigid rotor blades tilted the machine to the right as soon as it became airborne." I can then imagine him exclaiming, "What the helicopter have I got here? It's the world's first jet-propelled boomerang."

Personally, I should like to see the development of the L.B. Saucer taken up by Woomera and then made the sole equipment of all air forces, the more bellicose nations being encouraged to build as many as possible. However, I realize that this raises wider issues that could perhaps be more fittingly dealt with in your Christmas issue which, as always, I await with pleasure.

London, S.E.23. A. H. HAMMOND.

The First Guided Missile

IN your issue of October 3rd there was a most interesting article by Professor A. M. Low, who showed how the first guided missile was definitely a British invention.

His article refreshes my memory, for back in 1922 I was serving in the aircraft carrier *Argus*, which was then the only real carrier in the fleet. I remember, in the summer of that year, seeing a number of small pilotless monoplanes hoisted on board; they were very similar to the ones shown in Prof. Low's photographs, and with low-powered engines.

In those early days of carriers, and R.N. and R.A.F. co-operation, a lot of research work was executed from that ship. On the flying deck a short railway was laid, with a small trolley upon it, and at the bow there was a buffer; the small aircraft were placed on the trolley and the engine started up. The trolley ran along the rails and, as it hit the buffer, off went the aircraft. To the best of my memory, at least two dived over the side, but several actually flew for about two or three minutes.

Three years later I was at the R.A.F. establishment at Gosport, a large base for the Fleet Air Arm and Naval co-operation, and here further experiments were carried out with the small aircraft over land and sea. The unit was known as the Glider Flight.

London, S.W.1. E. G. RIDDLE (ex-R.A.F.)

Lost Control-Surfaces

THE letter from Lt-Col. C. E. Bowden in *Flight* of October 24th prompts me to recall an incident I saw during the war.

Col. Bowden's second paragraph states: "Only a safe, slow-speed, slotted and flapped machine like the Pioneer could have survived this loss of elevator control." I do not wish to detract from the Pioneer's remarkable performance, which fascinates me more every time I see it; but the performance of a Boeing Fortress 2 of the U.S.A.A.F.—and, more so, its pilot—was exceptional.

The machine in question took off from Polebrook Aerodrome, and from what I heard afterwards the ammunition in the rear turret exploded on take-off. The result was that the whole port *tailplane* was severed from the fuselage right at the root. The aircraft managed to keep airborne, and the pilot took it out to sea and released his bomb-load, returned to enable the crew to parachute to safety, and finally flew the aircraft out to sea again to crash. The pilot was never found. I was a few miles from Polebrook at the time and saw the machine myself flying directly overhead.

Grimsby, Lincs. P. H. T. GREEN.

[We recall, from personal observation, a somewhat similar occurrence involving a Bomber Command Halifax, which the pilot had flown from Germany to Yorkshire with half the tailplane shot away. Most of the crew, we believe, baled out, but the pilot and one other lost their lives when the aircraft suddenly became unmanageable on the approach to its base.—ED.]

IN BRIEF

Last week we published a letter from Mr. G. A. Broomfield, of Virginia Water, in which he referred to the year of one of Cody's flights being quoted as 1909, instead of 1910, at the "aerophilately" exhibition at the Science Museum. Mr. Broomfield now tells us that he also drew the attention of the museum authorities to the slip, which they have since corrected.

* * *

An Austrian reader, Harold Roscheck, seeks news of his brother Erich, an Me109 pilot who was reported missing after an engagement between his squadron and 24 R.A.F. fighters near Wedjez-el-Bab, North Africa, on April 5th, 1943. The Messerschmitt pilot was seen in a rubber dinghy two miles offshore, and was later reported to have been rescued and taken to hospital. Herr Roscheck's address is Mürzzuschlag, Mariazellerstrasse 19, Styria, Austria.

FORTHCOMING EVENTS

Nov. 14. R.Ae.S. Graduates' and Students' Section: "Liquid Fuel Rocket Motors"—Three Papers, by B. R. Diplock, B.Sc., Grad. I. Mech. E., Grad.R.Ae.S.; D. L. Lofts, Grad.R.Ae.S., and R. A. Grimston, Grad. I.Mech.E., Grad.R.Ae.S.

Nov. 15. British Interplanetary Society, Manchester Branch: "Rocket-motor Combustion Dynamics," by E. T. B. Smith, D.C.Ae., Grad. I.Mech.E., A.F.R.Ae.S.

Nov. 18. R.Ae.C.: Film Show, Londonderry House.

Nov. 18. R.Ae.S. Graduates' and Students' Section: "An Introduction to Helicopters," by J. D. Sibley, B.Sc., Grad.R.Ae.S.

Nov. 19. Royal United Service Institution: "The 'Bismarck' Operation in the Light of German Records," by Cdr. R. F. Jessel, D.S.O., D.F.C., R.N.

Nov. 19. Aircraft Recognition Society: Meeting. Guest speaker, C. H. Gibbs-Smith, M.A.

Nov. 20. R.Ae.S. Section Lecture: "Design of a Wind Tunnel Balance," by L. E. Leavy, A.F.R.Ae.S., and C. J. Saunders.

Nov. 21. Institute of Navigation: "The Vertical Reference in Navigation," by W. A. W. Fox and D. Barnett.

Nov. 25. Society of Instrument Technology: Symposium on "Control Valves." Papers by A. R. Aikman, B.Sc., H. R. Walton, B.Sc., A.M.I.Mech.E., and B. W. Balls, B.Sc., A.M.I.Chem.E.

Nov. 25. Plymouth Aircraft Recognition Society: Film Show.

Nov. 27. R.Ae.S.: "Photo-elasticity and Aircraft Research," by Col. H. T. Jessop, T.D., M.Sc., F.Inst.P.

Nov 29. S.L.A.E.: "The Bristol Proteus Gas Turbine," by D. Dekkars.

Dec. 2. R.Ae.S. Graduates' and Students' Section: "Aerodynamics of Wind Tunnel Design," by J. C. Gibbings, Ph.D., B.Sc.(Eng.), Grad.R.Ae.S.

CIVIL AVIATION

COASTER: Silver City Airways' nine Bristol Freighters, plying constantly between England and the Continent, have become a familiar part of the Channel scene. This Mk. 21 was photographed en route for Lympne, main base for the company's car-ferry services. "Flight" photograph

DISCUSSING COMMERCIAL HELICOPTERS

MANY of the country's foremost authorities on the helicopter were present in the crowded library of the Royal Aeronautical Society last Friday when Mr. Peter Masefield delivered his lecture (summarized on pages 620-3 of this issue) to the Helicopter Association of Great Britain.

Although members of the audience were equally agreed as to the merits of the paper, a natural measure of disagreement with some of its conclusions was apparent in the discussion which followed. Mr. R. Hafner (Bristol Aeroplane Company) thought that the lecturer's comparisons between the projected "BEAline bus" and existing types of helicopter were unfair: "brochures always show excellent performance." It should be remembered, he said, that the Type 173 was conceived when few people—even in B.E.A.—knew one end of a helicopter from the other. Bristol's studies had shown that the most promising helicopter configuration had tandem rotors, stub wings and two free turbines of high compression-ratio; they had also found that size was not critical—"the economy curves are very flat between 4,000 and 8,000 h.p." Rotor-weight was against the big helicopter, whereas a smaller machine lent itself to higher rates of production, quicker deliveries, higher frequencies in service and a lower unit cost.

"Ubiquity increases demand," said Mr. Hafner, "and the demand-supply parameter is more important than many in the B.E.A. specification." He also questioned the fuel-reserve specified by B.E.A., asserting that operators should take advantage of the helicopter's strong suits; the money wasted in carrying this fuel could be spent on suitably equipped landing-places along the helicopter routes.

Captain Forsythe contributed a reminder that there are other configurations besides tandem rotors. Blade-tip jets, he suggested, would provide the necessary smoothness of drive, with power plants installed away from the fuselage as in a conventional airliner.

Mr. J. L. C. Briscoe (M.C.A.) observed that the theoretically uneconomical Dove had brought a lot of money into the country; it would be a pity if all the helicopter effort were channelled into thoughts of large aircraft. He thought that the lecturer's notes on rotorstations might mislead designers as to the areas available in city centres; the proposed London rotorstation might occupy a space 1¼ times as valuable as London Airport. The M.C.A. were very concerned about noise; the speaker had heard the fear expressed that the "evil spirit of the tram" had been reincarnated in the helicopter.

As most of the noise came from the engines, said Mr. A. McClements (M.o.S.), there was a good chance of reducing it. His Ministry were looking into the problem but it seemed likely that silencers would be expensive. This speaker was worried by Mr. Masefield's reference to a possible need for pressurization; surely this was unnecessary, as helicopters were essentially low-flying vehicles. The concern about noise was not shared by Dr. G. S. Hislop (B.E.A.), who felt that M.C.A. were tending to worry too much about it. The noise-level of the present-day Bristol 171, he urged, should be accepted in larger helicopters. As to finding a site for a London rotorstation, why not use the roof of Waterloo Station itself? This question should be taken up with the Railway Executive. Dr. Hislop hoped that the A.R.B. would not require too many thousands of hours flying before awarding a C. of A. to a large helicopter.

Mr. J. Wotton (Percival Aircraft) said that a poor payload would result from the elaborate requirements made in the B.E.A. specification. He believed that the air-conditioning requirements, for example, were in excess of those for the Britannia; a number of the detail design points, he suggested, could be safely left to designers. He would appreciate an idea of the price which the operators would be prepared to pay. Turbine engines could be cruised at a higher percentage of power than that assumed in the specification; as to the suggestion that jet helicopters would be noisy, surely that depended very much on the type of jet helicopter. Referring to the changes in the B.E.A. requirements, which, he said, had made the specification obsolete, Mr. D. L. Hollis Williams (Westland Aircraft) said that apparently we were no nearer producing the commercial helicopter. Designers were anxious to start, however; what they wanted was a common inter-Service requirement, which was the best way of finding the necessary money for development. The suggestion made by previous speakers that B.E.A. were tending to ask for a helicopter which might prove too large, both for the designer and the operator, was supported by Mr. O. L. L. Fitzwilliams (Westland).

There was insufficient time for Mr. Masefield to reply fully to all the points raised in the discussion but he referred briefly to the main criticisms. The first cost of the projected helicopter, he said, was not so important; but it was vital to get the operational costs low or it would not be a transport vehicle and B.E.A. could not buy it. Fuel reserves were essential to regularity and punctuality, two essentials in the airline business, and this meant the ability to go in any weather. Responsibility for passengers' lives had always to be borne in mind and operational standards had to be good. Replying to Mr. Wotton, he said that B.E.A.'s operating experience with turbines had shown that 70 per cent power for cruising was quite high enough if overhaul times were to be kept down. As to leaving more details to the designers, B.E.A.'s requirements were based on operating experience. They knew the features most liable to keep an aircraft from flying; when they said that pneumatics, for example, were undesirable, they meant it.

NEWS FROM BRAZIL

IN order to propose measures for assisting his country's airlines, Brigadier Nero Moura, Brazilian Air Minister, recently appeared before the Brazil-U.S. Commission for Economic Development. In view of the shortage of spares for DC-3s (which still constitute 70 per cent of the country's commercial air fleet), the Minister suggested: (a) the acquisition of a five-year supply of spares for Brazilian airline use; (b) the manufacture of certain parts in Brazil; (c) the purchase of new aircraft for national air services; and (d) the acquisition of four-engined aircraft to enable Brazilian carriers to compete on international routes. The Commission will study the proposals under the two headings of spare parts and new aircraft respectively, and both projects will call for loans from the World Bank or the American Export-Import Bank.

In anticipation of increased airport traffic, the Governor of the State of Sao Paulo proposes to establish a directorate of airports. Excluding the many private landing fields, there are more than 170 airports in the State, and several government departments are engaged in their administration and maintenance. Increasing air traffic has emphasized the need for a central authority to standardize procedures and avoid confusion.

CHARTER NOTES

THE total of 134 revenue charter flights completed by Britain's major independent airline companies in the seven days ended November 8th is the highest yet recorded in these notes. Although the number of flights increased, they were mainly over short stage-lengths and the week's mileage dropped to about 87,500. Of eight companies surveyed two did not make any air charter flights and two more made only one flight. Of flights completed, 128 were from Berlin; altogether there were 28 passenger trips during which 1,312 people were flown a total of 17,500 miles and 106 freight flights in which 70,000 miles were covered in uplifting 645 tons of cargo. In terms of easily comparable statistics the week's work amounted to 172,000 freight-ton-miles and 392,000 passenger-miles (about 36,000 more t.m.). Berlin

LOOKING AHEAD: Japan Air Lines have given the somewhat confusing name of Suisei (Comet) to this Martin 2-0-2, one of two acquired from Northwest Airlines, and operated on regular internal services. The airline, which recently celebrated its first anniversary of post-war operations, has ordered two Series 2 Comets for delivery in 1955.

CIVIL AVIATION . . .

operations, stepped up for the Christmas rush, accounted for 40 per cent of the mileage and for all but 80 passengers and 52 tons of the total cargo flown. Yorks, as a type, were again the most-worked aircraft, covering 42,500 miles; Bristol 170s flew 25,000 miles; Dakotas, 15,000; and Vikings about 5,000 miles. This flying occupied approximately 545 hours in the air and earned about £44,000.

Prominent among the week's flying were trips connected with the Merchant Marine. B.K.S. Aerocharter effected an exchange of 24 seamen each way between Le Havre and Athens, and Airwork, Ltd., with two Vikings, brought 32 seamen from Cairo to London. At 2.30 p.m. on the afternoon of November 3rd, H. Clarkson and Co., brokers for Fairey Aviation, received an enquiry for an aircraft to rush out to Karachi with ship's spares; the aircraft took off only nine hours later.

Another interesting job was the transfer of about 20 tons of bullion from Ankara to Paris, effected mainly by Skyways Yorks. In Berlin, Air Charter stepped up their operation from 56 to 70 flights weekly. Flying to Hanover and Hamburg they made 23 passenger trips, each with 52 persons, and 47 freight trips each with eight tons. Silver City, on similar work, made 48 freight flights, each with five tons. This company's Bristol 170s flew 30 export cars across the Channel to Le Touquet, in a reverse direction they brought 29,000 lb of cheese to Lympne and then flew 19,000 lb of newsprint back to Le Touquet; 9,000 lb of miscellaneous freight was taken from Blackbushe to Tripoli on behalf of the Iraq Petroleum Company.

BRITANNIA FREIGHTERS

A RECENT B.O.A.C. announcement that the Board of the corporation had decided to purchase five freighter versions of the Bristol Britannia for delivery in 1955/56 implied that negotiations with the Bristol Aeroplane Co. were more advanced than was the case. The decision is, of course, subject to government approval and no order has yet been placed with the manufacturers. The situation is clarified by a subsequent Bristol announcement to the effect that negotiations have not yet been completed but design work has been proceeding actively for some time in the interests of B.O.A.C. The specification and negotiations, the company stated, are not yet finalized but are progressing satisfactorily.

RE-LIGHTING FIDO

AFTER its recent Air Ministry overhaul, the wartime fog dispersal installation at Blackbushe is being tested prior to being placed on a care and maintenance basis. Although maintained by the M.C.A. from 1947 to 1949, the Fido installation was used only once during that period—to allow a charter aircraft to take-off in fog with an urgent consignment of currency for West Africa. The purpose of the new tests, due to have been held within the last day or two, is to assess the reactions of pilots and passengers; the fog-clearing capabilities of the system are already known. Take-offs, overshoots and landings were to have been made by a number of civil aircraft including an Elizabethan and Viking of B.E.A., a B.O.A.C. York and a Dove of the M.C.A. Flying Unit.

AIRSTOP, HELIDROME OR ROTORSTATION?

CONFUSION may well arise when helicopters come into regular commercial operation if steps are not soon taken to find a standard name for landing-sites used by rotorplanes. "Airstop," the term used by the Ministry of Civil Aviation, is frowned upon by B.E.A., who prefer "rotorstation." The Aerodrome Owners' Association has coined "helidrome," but the suitability of this word has been questioned by more than one recent contributor to the correspondence columns of *The Times*. In America and Belgium—two countries where regular mail services are flown by helicopters—the term "heliport" is already in use.

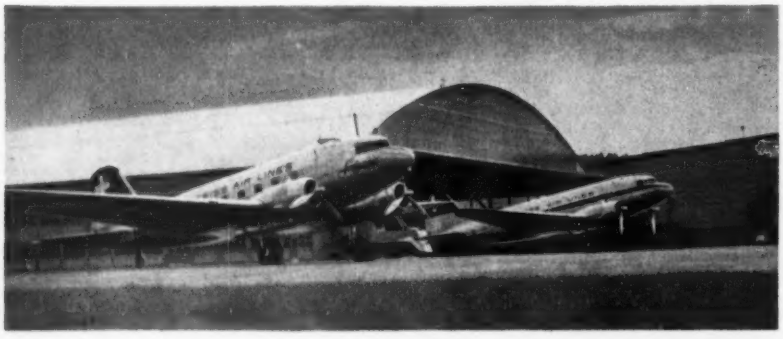
A reference to this controversial subject was made by Mr. Peter Masefield in his recent lecture to the Helicopter Association (pages 620-3 of this issue). "Rotorstation," said the lecturer, was originated some three years ago by Mr. N. E. Rowe when he was in charge of the Corporation's helicopter unit. Mr. Masefield condemned "airstop" as an etymological monstrosity ("a bus stops at a bus stop but the air fortunately continues to flow at an airstop") and described "helidrome" and "hoverplane" as terms of illiteracy. On the other hand, rotorstation "says what it means, rotor being a generic term for helicopter and station being recognized universally as a term for a stopping place of a public service vehicle."

STOPPING THE JET TRANSPORT

AMONG the special problems which affect the introduction of jet airliners is that of reducing speed on touch-down—particularly in less temperate climates, where runways are liable to become glazed with ice in winter months. The Comet, for example, depends almost entirely on its Dunlop wheel-brakes for adequate deceleration; its aerodynamic drag is naturally less than that for a comparable piston-engined airliner with drag-producing airscrews—windmilling or in reverse pitch.

The problem of ice-covered runways, on which good tyre adhesion may be lacking, was discussed in the *Daily Telegraph* recently by Sir Miles Thomas. Our engineers, he said, are turning their attention to means of assured deceleration in these conditions: "It may mean tail parachutes, streaming out on touch-down, or additional air brakes, or non-locking wheel brakes, or perhaps—as an extreme measure—reverse-flow jet pipes and even forward-facing rockets." Another possibility was to send trucks with flame-throwers along the runway just before the aircraft landed.

Precisely the same problem was discussed at a recent round-table conference on jet transports organized by our U.S. contemporary *Skyways*. The participants, who included representatives of aircraft and engine companies and airline operators, reached much the same conclusion as Sir Miles. Mr. F. W. Fink (Convair)



STILL GOING STRONG: Converted Dakotas continue to give valuable service in many parts of the world, and the problem of replacing them has yet to be solved by many airlines. Pictured here at Kloten, Zurich, are two of the Dakotas operated by Swissair; lacking the capital to re-equip its entire fleet, this company has decided to increase its order for three DC-6Bs to six, and to retain its present short-range fleet of four Convairs, two DC-4s and thirteen Dakotas.

"Flight" photograph

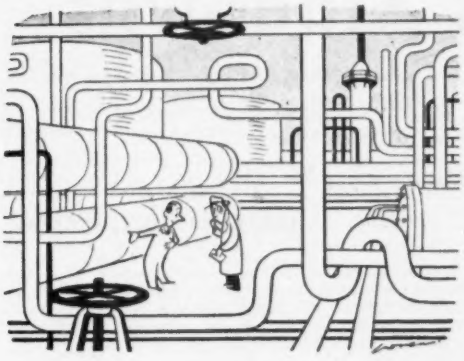
Fawley and the Wide Cut

BY BERNARD HOLLOWOOD

FOR New Readers. The year is 1952 and the Earth is behaving very much as it has behaved for millions of light-years. It is moving relentlessly in its orbit round the Sun, while the Moon, apparently uninhabited, still rhymes with June. Heavier-than-air flying machines are commonplace and the Earth-men are still afflicted by the common cold. . . .

Meanwhile, at Fawley, near Southampton . . . (*Now read on.*)

Fawley, friends, offers the last word in refinement, the very last word. Everything about *Esso's* giant plant is so refined—or should one say "refaned"?—that an ordinary brash Fleet-street reporter can soon feel out-of-place there, below par. He studies the handsome catalytic cracking unit and the well-behaved Edeleanu plant and is promptly assailed by a feeling of unworthiness. So full of refinement is the atmosphere of Fawley that he half-expects the workers to speak in elegant eighteenth-century circumlocutions. . . .



And yet, on my last visit, I distinctly heard a high-domed scientist use the term "Wide Cut." I could scarcely believe my ears.

"Gad, sir," I said, "you have the advantage o' me. "'Wide Cut' sounds like a sartorial blunder—too much padding at the shoulders, don't y'know."

He looked at me suspiciously.

"'Wide Cut'," he said, "is merely a term used to describe a certain utility turbine fuel that we produce for the Air Ministry."

"Pray accept my humble apologies," I said, bowing deeply.

"You may or may not know," he went on, "that supplies of kerosene are limited and might, in an emergency—and if you read your papers you should know what *that* means—*might* in an emergency prove inadequate. So here at Fawley we've been asked to make the most of our resources by extending the boiling range of kerosene to include 'lower boiling point' compounds . . . er—may I go on?"

"Do!" I said.

"Well, the result is a fuel that is somewhat more volatile, has a lower flash-point, is more plentiful and more readily available."

"A sort of *vin ordinaire*?"

"That's roughly it. A good *vin ordinaire*, of course."

"But not to be compared with the truly great vintage wines, eh?"

"Not to be compared with *Esso's* high grade aviation fuels—which are still available for use in civil aircraft!"

"Can you tell me anything else?" I said. "I've another inch of space to fill."

He rubbed his chin.

"Well, I could tell you about the Edeleanu process?"

"One inch," I said.

"Liquid sulphur dioxide is used as a solvent to extract unsaturated and aromatic hydrocarbons from burning oils. The extract from the plant is 'caustic washed'—treated with caustic soda to remove acidic material which could cause corrosion in aircraft engines . . . no gummy substances . . . specific gravity controlled . . . specified minimum calorific value. . . .

"Enough!" I said. "And thank you."

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That isn't all plane sailing!

Is that an aircraft, or a hawk with hiccups? Ask the intrepid birdman in the cockpit! Even HIS confidence is shaken by the trail of nuts and bolts that follow in his wake. No doubt, at this very moment, he is putting a hasty patch on his parachute and praying for a one-piece landing.

What a pity he spurned the practice of wiser aeronauts and refused to fit "Jac" Spring Washers beneath nut. They never let a man down . . . however far! For all who swoop about in the cerulean blue, "Jac's" the boy to beat the jitters! For all who put aeroplanes together, "Jac" is the washer that keeps them that way.

Made in sizes to fit every standard bolt, their saw-tooth serrations give a positive lock that is unaffected by vibration and shock. Send for samples and details.

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CIVIL AVIATION . . .

felt that reverse thrust was the answer. Some of the jet-engine companies, he said, had been giving thought to a forward-facing bleed-and-burn unit, although so far it was just a thought. Forward-facing JATO would meet the same reluctance as the parachute technique in commercial operation because of the expense. Mr. R. Kroon, of the Westinghouse gas-turbine division, declared that it was entirely feasible to destroy or reverse the engine thrust and that existing types of turbojets could be suitably modified. The simplest concept of a thrust-destroyer was probably that of a large "spoon" in the jet, which reversed the flow of the exhaust gases and thereby produced negative thrust.

Among the aircraft spokesmen was Mr. K. C. Gordon (Boeing), who favoured wing spoilers that would reduce lift the instant the aircraft was on the runway and increase the efficiency of the brakes. His company had also developed an anti-skid service which, they felt, should be incorporated in any new jet transport.

American observers have in the past gone to considerable lengths to find reasons for not using jet transports. It says much for the pioneer work done by B.O.A.C. that many of the more pessimistic theories have been forgotten in a matter of months; in fact, Mr. W. T. Dickinson (Douglas) described the need to find ways of stopping jet transports on slippery runways as the major problem facing this type of aircraft today.

VISCOUNT TO CYPRUS

THE prototype Viscount 700 has continued its series of route trials in the hands of B.E.A., the most recent being to Nicosia, Cyprus, on November 1st. The flying time from London to Rome was 3 hr, 25 min, and from Rome to Nicosia 4 hr, 40 min. Regular Viscount passenger services between London and Nicosia *via* Rome (expected to begin early next year) should thus reduce by some 3¼ hr the present schedule—by Elizabethans, which call at Athens *en route*.

CANADAIR'S NEW TRANSPORT

FLIGHT performance figures and direct operating cost calculations for the Canadair CL-21 twin-engined transport aircraft (a first description of which was given in the June 13th issue of *Flight*) are now available. Construction dates have also been given: the full-scale mock-up is due for completion this month, the first prototype and a static test airframe by June, 1954, and line production is to start in June, 1955. It will be recalled that the CL-21, which has Wright Cyclone 9HE engines, a pressurized cabin and a high-wing layout, is intended for short-haul routes.

On short-haul trunk services, the payload variation is from 7,850 lb, carried at a block speed of 180 m.p.h. over 100-mile stage distances, to 4,700 lb, carried at 224 m.p.h. over 850-mile distances, assuming fuel reserves for 300 miles plus 1 hr. With a maximum all-up weight of 32,500 lb, the twin-engined rate of climb at sea level is 770ft/min, and the single-engine ceiling 11,000ft. The time taken to climb to 15,000ft, at 140 m.p.h. air speed and under standard I.C.A.N. conditions, is 21 minutes.

Direct operating costs have been calculated on the basis of U.S. domestic trunk line operation, and the cost per flying hour, for a 150-mile stage length, is $105.40. The assumptions are a block speed of 182 m.p.h., daily utilization 8 hours, and fuel consumption 140 U.S. gallons per hour. A total cost of $500,000 (approximately £180,000) for aircraft, engines and spares is assumed to be depreciated in seven years, with a 10 per cent residual value, and values for flight operations and direct maintenance costs have been obtained by a study of those for existing U.S. machines of similar type. Typical performance and cost curves for the CL-21 are shown in the diagrams below.

ASSISTANCE FOR A.N.A.

IN spite of vigorous and continued protests by the Labour opposition, the Australian House of Representatives has passed the Civil Aviation Agreement Bill, which ratifies the Commonwealth Government agreement with Australian National Airways, the privately owned airline. Under the terms of this agreement, the Commonwealth is to guarantee a loan of £A3,000,000 to A.N.A. for the purchase of six Vickers Viscounts, and a further loan of the same amount for the purchase of replacement aircraft in seven years' time. There is to be a reduction by two-thirds of air route charges (payment of which had been disputed by A.N.A.) from August 1st, 1947, to June 30th last, and a 50 per cent reduction in air route charges from July 1st last. A.N.A. is to have the right of access to carriage of air mail and to Government business, previously the virtual monopoly of T.A.A., and both airlines will pay the same rate of income tax.

The aim of the agreement, as stated by Mr. Hasluck, Minister for Territories, was to ensure that the major air services flown by T.A.A. and A.N.A. were conducted under fair and active competition. The Government had rejected proposals for the amalgamation of both airlines because it was opposed in principle to monopoly. During the debate on the Bill, Dr. Evatt, leader of the opposition, affirmed that Labour would take every lawful step to repudiate the agreement if returned to office.

BREVITIES

TURNOVERS of almost $21 million were recorded in the I.A.T.A. Clearing House during both July and August, indicating an increase of over 40 per cent in interline passenger traffic compared with the same period of 1951.

* * *

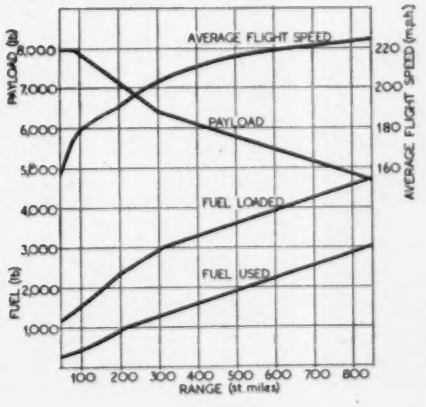
According to a Scottish correspondent, B.E.A.'s £8 return flights between London and Scotland are making deep inroads on railway bookings. He states that on one day alone 114 passengers flew from Renfrew to London—more than the total number of both first- and third-class passengers leaving Glasgow on the *Royal Scot* the same morning.

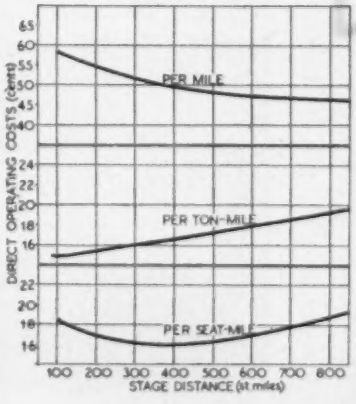
* * *

Aer Lingus officials recently concluded discussions in Dublin with Mr. Arthur Norden, a vice-president of Seaboard and Western Airlines, the American freight company. According to a report from Ireland, the subject of the talks is the possibility of a combined Irish and American passenger service between New York and Shannon, employing aircraft of Seaboard and Western, flown by American crews, but registered in Ireland and carrying Irish markings. Aer Lingus, it is stated, would be responsible for maintenance and booking arrangements, and for providing stewardesses.

* * *

Noting that B.E.A. carry only 60 passengers in winter for every 100 flown during the summer, although staff numbers remain constant throughout the year, Mr. Peter Masefield forecasts in the *B.E.A. Magazine* that this past summer's profit of £285,000





Operating curves for the Canadair CL-21 (see paragraphs above). (Left) Variation of payload, block speed, and fuel requirement with range for trunk-route operation. With fuel reserves for 300 miles plus 1 hour, the maximum range is 850 miles. The operating altitude (not shown) increases from 3,000ft at 100-mile distances to 15,000ft at 500 miles and above.

(Right) Direct operating costs for trunk-route operation, expressed in U.S. cents per mile, per ton-mile and per seat-mile. With higher block-speeds over long stage distances, costs per mile decrease, while ton-mile and seat-mile costs increase due to decreased payload.

CIVIL AVIATION . . .

will probably disappear in a winter loss of some £1,650,000. The result, he concludes, may well be a deficit of £1,400,000 for the present financial year, which ends on March 31st, 1953.

* * *

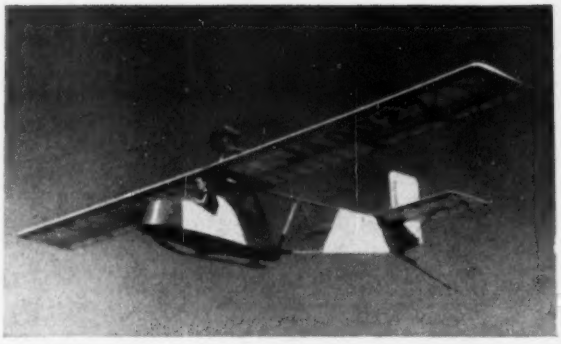
Formerly director of navigational service (telecommunications) in the Ministry of Civil Aviation, Mr. R. W. J. Sullivan, B.Sc., has been appointed controller of communications in B.O.A.C.

* * *

Mr. Dennis Morgan Tipp, a senior de Havilland engineer, recently left by B.O.A.C. Comet for Singapore. He is shortly to take up residence in Australia as the de Havilland service representative with Canadian Pacific Airlines. Mr. Morgan Tipp was the first engineer qualified by the A.R.B. to service pure-jet airliners.

* * *

At the second Transport Aircraft Hydraulic System Conference, held in Detroit at the end of October, and sponsored by the American company Vickers Inc., Mr. S. Oldfield, of B.O.A.C. read a paper describing the hydraulic systems of the Comet. Representatives of the 51 airlines and manufacturing companies participating in the conference were impressed to learn that no hydraulic problems had been encountered on the Comet in over 5,000 hr of scheduled operations.



ULTRA-ULTRA-LIGHT: Over 50 gliders have been built in Japan since permission to manufacture aircraft was granted under the terms of the Peace Treaty. This primary type has been turned into a rudimentary aeroplane by the fitting of a 10 h.p. engine above the centre-section.

FROM THE CLUBS

WE give below a further list of those who have qualified for the new categories of Pilot's Certificate introduced by the Royal Aero Club some three months ago. The column headed "Cl." (class) refers to the particular type of certificate awarded and, as in the first list issued (given in *Flight* of August 15th last), it will be noticed that several well-known pilots—including Jimmy Rush of the Throttle Benders—receive Class 1 certificates; the qualifications for this category include 500 hours as pilot-in-command of a private or club aeroplane, and evidence of landing at 20 different airfields. Another name included is that of Dr. K. G. Bergin, B.O.A.C.'s medical superintendent.

No.	Name	Cl.	Date	No.	Name	Cl.	Date
28,204	J. K. Arbuthnot	2	5.8	28,228	D. Greene	2	3.9
28,205	S. Karpelos-Schenker	1	5.8	28,229	F. G. Willinger	3	3.9
28,206	R. A. McMurtrie	1	6.8	28,230	J. F. Dyer	2	5.9
28,207	G. B. Claridge	3	7.8	28,231	T. R. Thomson	2	5.9
28,208	G. J. Bailey	2	13.8	28,232	J. L. N. Bennett-Baggs	1	5.9
28,209	H. S. Horth	1	13.8	28,233	A. M. Walmesley	3	8.9
28,210	W. Stubbs	2	13.8	28,234	J. Rush	1	10.9
28,211	I. B. Church	2	13.8	28,235	D. W. A. Stones	1	10.9
28,212	G. E. Robertson	2	13.8	28,236	J. H. Wagstaff	2	12.9
28,213	R. S. Dier	2	18.8	28,237	W. E. P. Johnson	1	12.9
28,214	L. C. Bendall	3	20.8	28,238	R. J. M. Hurst	1	12.9
28,215	K. M. M. Wastie	1	20.8	28,239	K. D. Fairburn	3	12.9
28,216	W. A. J. Hibberd	2	25.8	28,240	M. B. Rose	1	12.9
28,217	J. R. Robertson	2	25.8	28,241	A. S. Mann	1	17.9
28,218	H. Wood	1	25.8	28,242	J. L. Povey	2	17.9
28,219	K. W. Mason	1	25.8	28,243	J. C. Douglas	1	17.9
28,220	A. H. Curtis	2	28.8	28,244	G. D. Perks	1	22.9
28,221	W. P. Ferrier	4	28.8	28,245	L. Slater	2	23.9
28,222	L. Scorer	1	28.8	28,246	F. A. Biggs	4	24.9
28,223	D. Axel-Berg	1	28.8	28,247	K. G. Bergin	1	24.9
28,224	G. Blackwood	2	28.8	28,248	G. M. S. Kemp	1	24.9
28,225	W. E. Hawkes	3	28.8	28,250	D. C. G. Wright	1	30.9
28,226	E. S. Davis	2	28.8				
28,227	C. A. Richardson	1	3.9				

THE Derby Aero Club held its annual general meeting in the clubhouse on Sunday, October 26th. In a review of the year's activities, it was stated that the total number of hours flown had exceeded that for the previous year, and that 54 P.P.L.s were now held by the club. During the year, 13 A.T.C. cadets had completed flying scholarship courses and obtained P.P.L.s, and a further six licences and three instructor's endorsements had been obtained by club members. The president, Mrs. J. Harben-Grice, and the chairman, Mr. J. H. Gibbs, commented favourably on the year's flying.

THE defenders at Denham's breakfast patrol on October 26th were assisted by a cloudless sky, in spite of which four attacking aircraft managed to arrive unobserved and so obtain free breakfasts for their occupants. Representatives from many clubs were present, including visitors who had flown down from Leicester. Tom Hayhow arrived in his record-breaking Aiglet, but not before being spotted from a Taylorcraft Plus D; another active defender was A.V-M. Bennett in his Dart Kitten. Prizes, including a dozen eggs for the sealed landing-time winner, were later presented by A.V-M. Bennett, whereupon the success of the Broxbourne club was clearly evident. Finally, Mr. Hayhow presented a useful five gallons of petrol to the most successful defender—a gesture much appreciated by his hosts.

RULES for the new Coventry Gliding Club were adopted at a recent general meeting, when an annual subscription of £5 5s and membership fee of £2 2s were approved. "Founder-members" who join before December 31st, however, will pay only a guinea for membership. The club has been granted the use of the Baginton Airport, and the acting chairman, Mr. Michael S. Hunt, has announced that a C. of A. for one of the club's two sailplanes—a Cadet—would soon be obtained.

THE Yorkshire Aeroplane Club report 280 flying hours since C.F.I. Frank Morgan joined in mid-August, and 11 pilots' certificates have been gained. A.T.C. cadet training is continuing, and two ex-cadets of the Club have been selected for R.A.F. pilot training. On Sunday last, Mr. Peter Rayner was due to make a series of parachute drops at Sherburn. The Club's annual ball is to be held at the Majestic Hotel, Harrogate, on November 28th.

NIPPY NIPPER: With a 75 h.p. Minié engine, this Max Plan Midget, which made its first flight on June 5th last and has now completed the tests for its "certificate of limited aeronautical navigability," weighs 796 lb and cruises at some 150 m.p.h. Endurance is 2½ hr.

SERVICE AVIATION

Royal Air Force and Naval Aviation News

The Duke's Flying Instruction

HAVING decided to learn to fly, the Duke of Edinburgh has passed his aircrew medical tests at the R.A.F. Central Medical Establishment and will, from now onwards, take instruction as opportunity affords.

His instructor will be F/L. C. R. Gordon (portrait below), who, since he joined the R.A.F. in 1942, has logged 2,500 flying hours, 640 of which have been spent instructing on Meteor 7s.

The Duke will receive his instruction at White Waltham, Berkshire, the headquarters of Home Command, and the *ab initio* type aircraft will be a standard de Havilland Chipmunk.

Malaya A.O.P. Awards

THREE army officers of No. 656 (A.O.P.) Squadron in Malaya have been awarded the Distinguished Flying Cross. One, Capt. T. N. W. Lacey, R.A., has been with the unit since December 1949 and from February last year has commanded No. 1907 Flight in support of No. 26 Gurkha Infantry Brigade. Another, Lt. J. F. Campbell, R.A., has served for nearly two and a half years with No. 656, during which period he has flown on more than 1,100 sorties; he has been instrumental in locating a number of bandit camps in the area controlled by No. 3 Commando Brigade. The third officer to be decorated, Lt. D. T. Young (Royal Scots), has been with the unit for more than two years as second in command of No. 1911 Flight, which is serving in support of No. 48 Gurkha Infantry Brigade in Pahang. No. 1911 Flight is manned entirely by personnel of the Glider Pilot Regiment, in the new role of light liaison pilots.

F/L. C. R. GORDON, the instructor appointed to teach the Duke of Edinburgh to fly (see first news-item above).

SHOWING THE FLAG: The four Canberras now on the R.A.F. goodwill mission in South America. They are seen here lined up on the tarmac at Dakar, French West Africa. The crossing of the South Atlantic Ocean to Recife, Brazil, involved a flight of 1,965 miles, which was completed in 4 hr 19 min.

New A.O.C. Hong Kong

WHEN, next December, A. Cdre. R. C. Field takes over his new appointment as A.O.C. Hong Kong it will be his third tour of duty in the Far East. His first spell was from 1936 to 1938, at Kai Tak and H.Q. Far East Command—as F.E.A.F. was then termed. His second began on September 1st, 1945, the day before the Japanese surrender, when he joined No. 222 Group, A.C.S.E.A. as Air Staff Operations Officer. Six weeks later he went to Air H.Q. Ceylon as Senior Air Staff Officer.

Artists Aid Service Charities

IN London on November 5th, the Secretary of State for Air, Lord De L'Isle and Dudley, opened an exhibition of portraits and landscapes by Honor Earl and Hortense Kelly. In his speech, Lord de L'Isle and Dudley said that it was most generous of the two artists to offer half the proceeds of the sale of pictures during the exhibition to the R.A.F. Association and the R.A.F. Benevolent Fund. (The Hon. Mrs. Earl has also offered to give to these organizations half the proceeds of any portrait commissions she receives during the same period.) The Secretary of State for Air continued by saying that it was only seven years since the end of the war, when the men of the Royal Air Force had flown in defence of their country, and we still owed them a great debt.

The arrival of H.R.H. the Duchess of Gloucester lent an even greater lustre to a scene in which, amongst the distinguished portrait-subjects present in the flesh, were Mr. Noël Coward and Mr. Jimmy Edwards; and to be seen studying the portraits were Air Chief Marshal Sir Frederick and Lady Bowhill, Air Chief Marshal Sir James Robb, A.V-M. Sir John Cordingley, Lady Slessor, Lord Hives, Dame Helen Gwynne-Vaughan, and many other personalities of the arts, the Services and industry.

We suggest that a visit to the exhibition, which is to remain open until November 28th, will be very well worth while. It is being held at the head offices of Thos. Parsons and Sons, Ltd., the paint manufacturers, at 70 Grosvenor Street, London, W.1.

R.A.A.F. Appointments

AFTER selection to attend the next course at the Imperial Defence College, A. Cdre. C. D. Candy, O.B.E., is now on his way to Britain. At the conclusion of the course he expects to remain here for a further two years on exchange duty with the R.A.F. His post as Director of Organization and Staff Duties at R.A.A.F. headquarters has been taken over by G/C. R. F. M. Green, D.S.O., who recently returned to Australia after a tour of duty in Singapore as C.O. of No. 90 Wing, R.A.A.F.

R.N.V.R. Squadron moves to Abbotsinch

THE only Scots-manned air unit of the Royal Naval Volunteer Reserve, No. 1830 Anti-submarine Squadron, commanded by Lt.-Cdr. R. C. Read, R.N.V.R., which moved to Donibristle, Fife, nearly two years ago, has returned once more to R.N. Air Station Abbotsinch, where it was formed in 1947. The airfield at Abbotsinch has been under reconstruction. The new Scottish Air Division, R.N.V.R., under Cdr. J. D. Murricane, M.B.E., D.S.C., R.N.V.R., established at Donibristle this summer, will also be moving its headquarters to Abbotsinch.

Technical Flights at Universities

UNDERGRADUATES of engineering and certain other technical faculties at Birmingham, Leeds, Southampton and Nottingham Universities are to be invited to join airfield construction or technical flights in their University Air Squadrons. They will enrol as members of the R.A.F.V.R. and will be eligible for pay and allowances under current R.A.F.V.R. regulations. Lectures will be given during term and the annual continuous training will be done during vacation.

Airfield Construction Flights will be formed at Birmingham and Leeds. Training for these will include design and layout of airfield facilities, construction of temporary airfields, and such subjects as camouflage and explosives. Technical flights to be formed at Southampton and

SERVICE AVIATION . . .

Nottingham will carry out training in the broader interests of technology in the R.A.F. in all its branches, technical administration, and general service training.

R.Aux.A.F. Appointments

THE Air Ministry has announced three appointments to commands of R.Aux.A.F. units. S/L. J. A. Forrest has taken over No. 602 (City of Glasgow) Squadron and S/L. G. E. Barrett is now the commanding officer of No. 2612 (County of Aberdeen) Light Anti-Aircraft Squadron. The third appointment is that of S/L. A. C. Cooper to command No. 3509 (County of Stafford) Fighter Control Unit.

Canadian C.A.S. on R.C.A.F.

SPEAKING at the Remembrance Day dinner of the R.C.A.F. Veterans Association, Air Marshal W. A. Curtis, Chief of the Canadian Air Staff, observed that the only fighters in Europe capable of matching Soviet aircraft were the R.C.A.F. F-86s.

Air Marshal Curtis is to retire in January next and his place will be taken by A.V-M. C. A. Sleman. While under Air Marshal Curtis's command the R.C.A.F. has grown from less than 12,000 in 1947 to more than 37,000. At the end of the present expansion, the R.C.A.F. will have 41 regular and auxiliary squadrons and a strength of approximately 50,000 men.

Taranto Anniversary

TEN of the pilots and observers who took off from the moonlit flight-deck of the aircraft carrier *Illustrious*, to win for Britain one of the most significant air victories of World War II, were among the guests invited to a dinner at the R.N. Barracks, Lee-on-Solent, which was due to take place last Tuesday, November 11th—the anniversary of the Fleet Air Arm's raid on the Italian fleet in Taranto Harbour.

The dinner was arranged to take place 12 years, almost to the hour, after the first flight of Swordfish aircraft set out on the 170-mile flight across the Mediterranean on an operation which had been under consideration long before Italy entered the war, and which was to provide striking proof of the potency of Naval air power. Twenty aircraft left three of the most powerful units of the Italian battlefleet sinking and others damaged.

The First Sea Lord, Admiral Sir Rhoderick McGrigor, G.C.B., D.S.O., was invited as the guest of honour and other guests accepting invitations included Admiral Sir Lumley Lyster, K.C.B., C.V.O., C.B.E., D.S.O., who commanded the carriers in the Mediterranean; Admiral Sir Denis Boyd, K.C.B., C.B.E., D.S.C., then the Commanding Officer of the *Illustrious*; the Fifth Sea Lord, Vice-Admiral E. W. Anstice, C.B., and the Flag Officer (Air) Home, Vice-Admiral C. E. Lambe, C.B., C.V.O.

R.A.F.A. President

ACCEPTING a unanimous invitation from the national council of the Royal Air Forces Association, Marshal of the Royal Air Force Lord Tedder has consented to become president of the R.A.F.A. The office became vacant on the recent death of Sir Richard Peck.

Helicopter Squadron Commander

THE new commanding officer of No. 705 Squadron, the Royal Navy's helicopter unit, is Lt. Cdr. H. R. Spedding, R.N., who has relieved Lt. Cdr. S. H. Suthers, D.S.C., R.N.

Rhodesian Visit

FLYING a Vampire T.11 of the R.A.F. Flying College, Manby, W/C. R. I. K. Edwards, D.F.C., A.F.C., and W/C. J. Barraclough, D.F.C., A.F.C., of H.Q. Flying Training Command, recently made a rapid staff visit to R.A.F. units in Southern Rhodesia. Flying time for the outward journey totalled 17 hr 45 min but strong headwinds made the return journey slightly longer at just over 20 hr.

At Flying Training Command H.Q. W/C. Edwards is in the Air Staff Planning Branch, and W/C. Barraclough is Wing Commander Training.

New C.O. for U.L.A.S.

THE new commanding officer of the University of London Air Squadron is W/C. A. W. Heward, O.B.E., D.F.C., A.F.C. He takes the place of W/C. A. V. Rogers who has commanded the squadron for the past three years.

W/C. Heward, who commanded No. 50 and No. 97 Squadrons of No. 5 Group during the war, was awarded his D.F.C. in 1943 and was given a bar a year later.

By Any Other Name . . .

AFTER having been misspelt since 1944 as "Spitalgate," the R.A.F. station of that name is to revert to the earlier, and correct, spelling of "Spirtlegate."

The error came to light when, recently, Viscount Sandon was passing by the Royal Air Force station outside Grantham; he noticed the name "Spitalgate" on the signboard, a spelling which eight years before had been authorized by the Air Ministry. Viscount Sandon, who had family connections in the district many years ago, and who is also a member of the Royal Commission on Historical Manuscripts, believed the name should be spelt Spittlegate. He was interested enough to make inquiries in the district, and these confirmed that the name had, in fact, been Spittlegate since about 1600.

A.O.P. Efficiency Trophy

FOR the second year in succession No. 663 A.O.P. Squadron, Hooton Park, Chester, has won the A.O.P. efficiency trophy. A parade and celebration to mark the double win will shortly take place.

No. 663 is commanded by Maj. C. Surgeon, R.A., who took over from Maj. J. R. Bandy last month.

A.T.C. Cadets for Pakistan

FOLLOWING an invitation by the Government of Pakistan to the R.A.F. to send an officer and four cadets for a 15-day tour of the country, a party has left for Karachi as supernumerary aircrew in Transport Command Hastings. It consists of S/L. V. G. Hogan, D.F.C., Intelligence Officer, Home Command; Sgt. T. J. Burns, No. 1213 (Andover) Sqn., A.T.C.; Cpl. B. Eley, Derby School C.C.F.; Cpl. J. W. Barker, No. 628 (Pinner County School) Sqn., A.T.C.; and Sgt. D. J. Moreton, No. 492 (Hall Green) Sqn.

R.A.F. Reserves Club

AT a committee meeting after the club's A.G.M., Mr. G. J. Kellow was elected chairman and A. Cdre. G. F. Smylie vice-chairman. A.V-M. Sir Victor Tait was elected a vice-president of the club, to fill the vacancy caused by the recent death of Sir Richard Peck.

Although S/L. W. A. G. Goldsworthy has had to relinquish his appointment as secretary he will still deal with the club's publicity and social activities. The new secretary, Mr. L. C. R. Phillips, will take up his duties shortly.

On Wednesday, November 26th, the club is holding a luncheon at the Criterion Restaurant, London, at which the guest speaker will be Air Chief Marshal Sir John Baker. His subject will be "The Middle East."

It is hoped that the new premises in South Street will be ready for occupation in January.

Scottish A.O.P. Squadron Badge

ON Sunday, October 26th, at Scone airfield, Perth, Lt.-Gen. Sir Colin M. Barber, K.B.E., C.D., D.S.O., G.O.C-in C. Scottish Command, presented No. 666 A.O.P. Squadron, R.Aux.A.F., with their new badge. It was received by Major Ian G. Neilson, D.F.C., T.D., R.A. (T.A.), who commands the unit.

The badge shows a lion rampant, charged with the cross of St. Andrew, in front of two gun barrels crossed. The motto is: *Speculatum Ascendimus* ("We arise to observe").

Reunion

THE sixth annual reunion dinner of No. 86 Squadron will be held at the Imperial Hotel, Russell Square, London, on Saturday, November 29th. All ex-ground and aircrew and interested Coastal Command personnel are invited to attend. Particulars from Mr. S. H. Carder, 3 Grandstand Cottages, Gatwick Airport, Surrey.

BACK FROM MIG ALLEY are (left to right) F/L. J. M. Nicholls, an R.A.F. exchange pilot; W/C. R. T. P. Davidson, a R.C.A.F. exchange pilot from the Canadian fighter wing at North Luffenham; Maj. A. J. Gillis, a U.S. Marine Corps exchange pilot and 1st Lt. W. E. Brown, U.S.A.F. All four are flying Sabres with the U.S.A.F. 4th Fighter Interceptor Wing in Korea.

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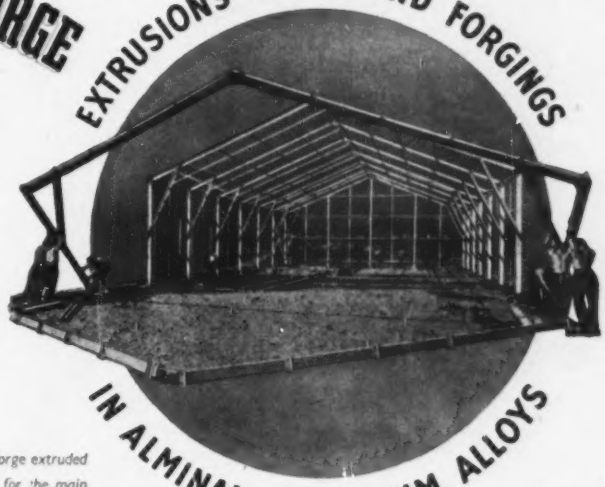

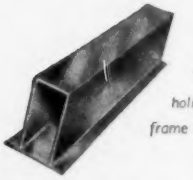

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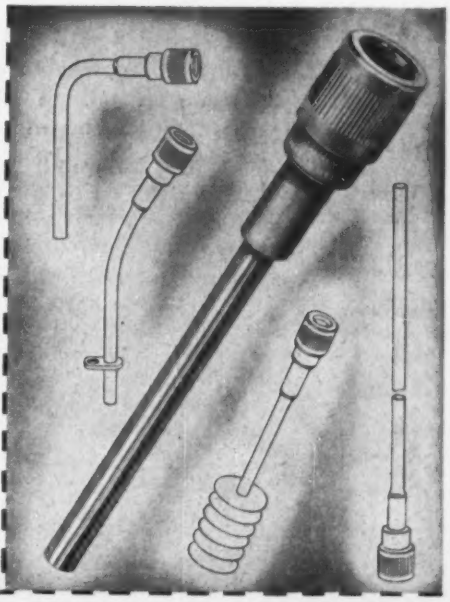

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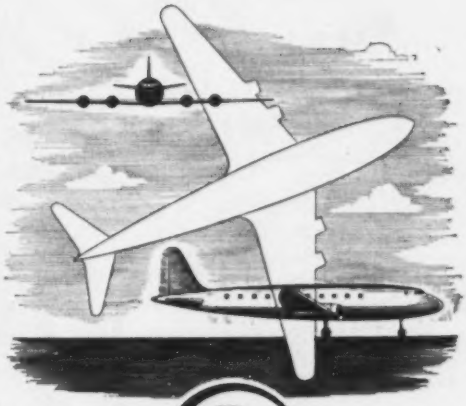

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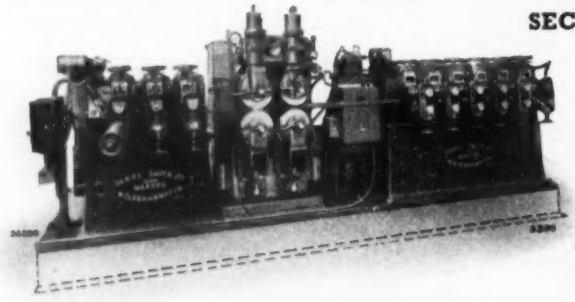

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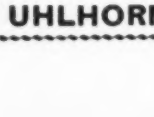

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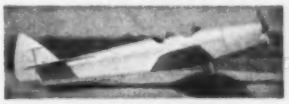

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

Application No. 89 (amended) from Airwork, Ltd., of 13, Chesterfield Street, London, W.1, for an all freight service with Bristol 170 aircraft, for the carriage of freight and mail between London (Blackbushe) and Jebal Ali (Trucial Coast) with intermediate traffic stops at Nicosia, Tripoli (Lebanon), Kirkuk, Baghdad, Basra, Kuwait, Dhahran, Bahrein and Dukhah (Qatar Peninsula), at a frequency of from two services weekly to one daily, during the period from February 1, 1953 to January 31, 1960.

FLOAT Olley Air Service, Ltd., of Croydon Airport, Croydon, Surrey:—

Application No. 109 for a normal scheduled service with DH.89 and DH. Dove and Airspeed Consul aircraft for the carriage of passengers, supplementary freight and mail between London (Croydon) and Cherbourg (Maupertus) with an intermediate traffic stop at Southampton (on demand) at a frequency of from two services weekly to six services daily, during the period from January 1, 1953 to December 31, 1959.

Application No. 110 for a normal scheduled service with DH. 89, DH. Dove and Airspeed Consul aircraft for the carriage of passengers, supplementary freight and mail between London (Croydon) and Le Havre (Octeville) with an intermediate traffic stop at Southampton (on demand) at a frequency of from two services weekly to six services daily, during the period from January 1, 1953 to December 31, 1959.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to these applications must be made in writing, stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9 Buckingham Gate, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, must reach them within the period allowed for the making of representations or objections. [9989]

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SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

NEW ZEALAND

AIR TRAFFIC SERVICES—CIVIL AVIATION

APPLICATIONS are invited from suitably qualified persons to fill a vacancy for a superintendent, air traffic services (development), in the Civil Aviation Branch of the Air Department, Wellington, New Zealand.

SALARY up to £950 (N.Z.) per annum according to qualifications and experience.

THE superintendent will be required to direct the development unit of the Air Traffic Services (Joint Military/Civil) section of the Air Department. His responsibilities will include functional planning of air traffic control facilities with special reference to the provision of building technical equipment, electronic aids and communications. Preference will be given to applicants who have a wide practical experience. A degree or corporate membership of a recognized professional engineering body will be an advantage.

APPLICATION forms, conditions of service, etc., may be obtained from:—

The High Commissioner for New Zealand,
415 Strand,
London, W.C.2,

mentioning this paper and quoting reference No. 3/47/30.

COMPLETED applications to be lodged not later than Friday, November 28th, 1952. [8949]

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SENIOR AND INTERMEDIATE

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SHORT BROS. AND HARLAND, LTD.,

in their Aircraft Drawing Office,
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Applications, stating age, experience and salary required, to—

CHIEF DRAUGHTSMAN,
SHORT BROS. AND HARLAND, LTD.,
QUEEN'S ISLAND, BELFAST. [8975]

PILOTS

WEST AFRICAN AIRWAYS CORPORATION have vacancies for pilots to be appointed as junior captains and invite applications from pilots who hold a current Airline Transport Pilot's Licence. West African Airways Corporation have an expanding fleet of Marathon, Dove and Warfarer aircraft.

SALARY according to qualifications and experience within the range of £1,000 per annum and £1,999 per annum.

FREE fully furnished accommodation is provided in West Africa, but married men on initial engagement may be required to serve for a few months before being joined by their families.

FREE return passages are provided each tour for the employee, his wife and up to two children, not exceeding 18 years of age.

TOURS of duty will be from 12 to 15 months with leave on full salary at the rate of one-fifth of the period of service in West Africa.

CONDITIONS of service will include membership of a pension scheme allowing retirement at 45, subject to a minimum of 10 years' service. (Retirement five years earlier may be arranged by mutual agreement.) In the case of employees not completing 10 years' service, a gratuity arrangement exists whereby, subject to a minimum of four years' service, a payment at the rate of £150 for each full year of service will be made on termination of appointment.

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APPLICATIONS should be submitted to the local Agents of W.A.A.C. B.O.A.C., Airways House (Room 105), Great West Road, Brentford, Middlesex. [0746]

RADIO OFFICERS.

WEST AFRICAN AIRWAYS CORPORATION have vacancies for radio officers. Essential qualifications include possession of current M.C.A. 1st class flight radio telegraphy operators' licence.

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TOURS of duty will be from 12 to 15 months with leave on full salary at the rate of one-fifth of the period of service in West Africa.

APPLICATIONS should be submitted to the Local Agents of W.A.A.C., British Overseas Airways Corporation, Airways House (Room 105), Great West Road, Brentford, Middlesex. [0741]

CHIEF STRESSMAN.

APPLICATIONS are invited from senior stressman with experience in pneumatic and hydraulic components. Knowledge of M.O.S. and A.R.B. design approval system is essential. Please write, giving full details, qualification and experience to Chief Designer, Dunlop Rubber Co. Ltd., Aviation Division, Fordhill, Coventry. [0877]

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TECHNICAL assistants of degree or H.N.C. (Elect.) standard for the design and development of aircraft electrical systems. Previous experience preferred.

WRITE, stating age, qualifications and details of experience, to Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [8884]

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LICENSED radio engineer and radio mechanics at our base at Stansted Airport, Essex. Apply by letter or telephone to the Senior Radio Engineer, Aviation Traders, Ltd., Southend Airport, Essex. Tel.: Rochford 56491. [0956]

TECHNICAL illustrator required, aged 23 or over, with considerable practical experience.—Applications, in writing to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds., stating age, experience and salary required. [0935]

AIRCRAFT or mechanical draughtsmen required, all grades. Apply, stating age, experience and salary required, to The Chief Draughtsman, Alan Munts and Co., Ltd., Aircraft Division, Langley Aerodrome, Slough, Bucks. [0959]

SENIOR and intermediate design draughtsmen with good experience of aircraft or light structural or mechanical engineering, required for aircraft and armament project work.—Apply by letter to Portsmouth Aviation Ltd., The Airport, Portsmouth. [0978]

ESTIMATORS (two) experienced, General engineering, preferably with sheet metal. One to ultimately take charge of estimating. Apply in writing, stating fullest details of experience to General Manager, Delaney Gallay, Ltd., Hardware Road, Cricklewood, N.W.2. [0973]

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SENIOR spares schedule clerk, capable of taking charge of compilation section, required by Percival Aircraft, Ltd., Luton Airport, Beds. Good welfare facilities, including staff pension scheme.—Applications, in writing, to Personnel Manager, stating age, experience and salary required. [0937]

LANCASHIRE AIRCRAFT CORPORATION, LTD. (Skyways of London), are now appointing additional navigating officers for their York fleet.—Applications from holders of appropriate M.C.A. licences should be made in writing to the Personnel Manager, Bovingdon Airport, Herts. [0950]

ARMSTRONG SIDDELEY MOTORS require technical assistants for research and development on gas turbine combustion systems. Opportunities exist for original work of a highly interesting nature in a new field.—Apply in detail to Reference SA.3, Personnel Manager, Armstrong Siddeley Motors, Coventry. [8966]

SENIOR technical assistant/stressman required for interesting development work. Knowledge of thermodynamics an advantage, degree preferable. Salary according to qualifications. Apply Personnel Manager, The Bristol Aeroplane Co. (Weston) Ltd., Oldmixon, Weston-super-Mare. [8974]

MECHANICAL engineering draughtsman. Experienced men, preferably—although not necessarily—with aircraft experience, required for work associated with modern aircraft design.—Write, stating age, experience, salary, etc., and quoting reference MDD, to Personnel Officer, Saunders-Roe, Ltd., East Cowes, I.O.W. [8946]

H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows: designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouses, Wolverhampton. [0942]

DRAUGHTSMEN of H.N.C. standard with instrument or precision engineering experience required for aircraft pressurizing air conditioning work at Luton office.—Applications, with full particulars and salary required, marked "London," to Personnel Officer, Normalair, Ltd., Yeovil, Somerset. [8784]

ARMSTRONG SIDDELEY MOTORS, Coventry, have a vacancy for a senior designer (mechanical), aged 30-35, workshop and aero engine design experience essential, gas turbine knowledge an advantage. For important work on the project design of gas turbine aero engines.—Apply in detail to Reference HSR.1, Personnel Manager, Armstrong Siddeley Motors, Coventry. [8894]

WEIGHTS engineer required to take charge of weights department, also senior assistant, for work on fixed wing and helicopter aircraft. Good welfare facilities, including staff pension scheme.—Applications, in writing, to Technical Director, Percival Aircraft, Ltd., Luton Airport, Beds., giving details of age, training, qualifications, experience and salary required. [0952]

DEVELOPMENT engineers, designers, draughtsmen, technicians, technical writers, technical illustrators and technical assistants required for aircraft pressurizing high altitude breathing, etc.—Fully detailed applications with salary required, to Personnel Officer, Normalair, Ltd., Yeovil, Somerset. Local interviews arranged where convenient. [0795]

TEST laboratory assistants (male) required by Percival Aircraft, Ltd., Luton Airport, Beds. National Certificate standard and previous experience on design of test laboratory equipment desirable. Good welfare facilities including staff pension scheme.—Applications, stating qualifications, experience, age and salary required, to Personnel Manager. [0596]

HANDLEY PAGE (Reading), Ltd., The Aerodrome, Woodley, Reading, have vacancies in their design offices for intermediate and senior draughtsmen, stressmen and loftsmen. They have an interesting project on hand. The positions are progressive and offer good scope for advancement to the right men.—Please send full particulars to the Personnel Officer. [0974]

TECHNICAL office assistants required for stressing and performance calculations on aircraft undercarriages and hydraulic equipment. Applications from experienced technicians or recent university graduates in engineering or mathematics will be considered.—Write for application form to Chief Designer, Electro-Hydraulics, Ltd., Warrington. [0982]

REQUIRED immediately by Percival Aircraft, Ltd., Luton Airport, Beds, several draughtsmen with comprehensive experience of engine installations and allied systems. Good welfare facilities, including staff pension scheme.—Applications, in writing, stating age, qualifications, experience and salary required, to the Personnel Manager. [0601]

SENIOR technical assistant required for engine technical office. Knowledge of engine stress calculations and mechanical testing including vibration analysis desirable. B.Sc. and/or A.M.I.Mech. E. preferred.—Please write giving age, previous experience and qualifications in chronological order to: The Personnel Officer, The de Havilland Engine Co. Ltd., Stag Lane, Edgware, Middlesex. [8899]

APPLICATIONS are invited from senior and intermediate design draughtsmen. Experience of aero-engine design desirable, but not essential. Also checkers.—Please write, stating age and giving details of previous experience in chronological order to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [0939]

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SITUATIONS VACANT

ENGLISH ELECTRIC have vacancies for aircraft draughtsmen at Warton Aerodrome, near Blackpool. Men with good aircraft drawing office experience are invited to apply for these interesting positions which carry good salaries.—Write, giving full details, quoting reference 130R, to Central Personnel Services, the English Electric Co., Ltd., 536-7 Strand, London, W.C.2. [8940]

BOLTON PAUL AIRCRAFT, Ltd., Wolverhampton, require senior electronics engineer or physicist, with adequate theoretical and practical design experience, to take charge of department engaged in development of precision electronic instruments, servo mechanisms, analogue computors, etc.—Applications should detail qualifications and experience and state salary required. [8880]

AIR FORCE, Naval, civil and helicopter aircraft all under design and development at Percival Aircraft, Ltd., Luton Airport, Beds. Applications are invited from senior and junior draughtsmen and stressmen, for work on this interesting programme. Good welfare facilities, including staff pension scheme.—Write, giving details of experience and salary required, to Personnel Manager. [8966]

APPLICATIONS are invited from design draughtsmen and stressmen, also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero-engines.—Applications should state full particulars of experience and qualifications and should be addressed to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [8962]

INTEGRAL, Ltd., Birmingham Road, Wolverhampton, invite applications for vacancies on the staff in the design and development department for interesting work on aircraft hydraulic mechanisms. Experience of aircraft component design or testing and good technical qualifications are an advantage.—Will applicants please state age, qualifications, details of experience and salary required. [8954]

SENIOR assistant is required for flight trials and assessment of airborne radar equipment. Experience of radar and similar work in the laboratory and in the air under operational conditions is essential. Candidates must be prepared to travel and work away from the laboratories. (Ref. S8/LK.1).—Replies should be sent to the Staff Manager, The Grove, Stanmore Common, Stanmore, Middlesex, stating age, qualifications and experience. [8985]

PHYSICISTS and engineers with degrees and Higher National Certificates are required for a field trials team and for assessment work in connection with the trials. Candidates must be prepared to travel and work away from the laboratories. Applications should be sent in writing to the Staff Manager (Ref. S8/JP.1) stating age, qualifications and experience to The Grove, Stanmore Common, Stanmore, Middlesex. [8986]

THE de Havilland Aircraft Co., Ltd., will shortly be opening a drawing office at their Chester factory and there will be vacancies for senior and intermediate draughtsmen who are experienced in the design of aircraft structures, electrical and engine installations, also customers' special requirements for civil aircraft.—Apply in writing, giving résumé of experience, age, etc., to the Chief Draughtsman, de Havilland Aircraft Co., Ltd., Hatfield, Herts. [8943]

ROTOL, Ltd., Gloucester, have vacancies on technical staff dealing with performance and functional problems associated with the design of both orthodox and new propulsion systems for air and marine craft. Main qualifications required are B.Sc. or equivalent in general engineering or in naval architecture, specialisation in either aerodynamics or hydrodynamics being an asset.—Reply, giving full details of qualifications and experience to Personnel Manager. [8893]

RADLETT RESEARCH LABORATORIES, Handley Page Ltd., have vacancies in their new Radlett research laboratories for technical assistants with a degree or H.N.C. for work on an interesting programme of mechanical, structural, electronic, hydrodynamic and thermodynamic testing. These vacancies offer good scope for advancement to the right men. Help will be given toward obtaining housing accommodation.—Apply in writing to Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [8962]

ROLLS-ROYCE, Ltd., Glasgow, invite applications from young qualified engineers for a vacancy as a technical assistant in their technical services department. This vacancy requires a knowledge of piston or gas turbine aero engines, and the successful applicant must have as a minimum requirement H.N.C. plus two years' practical experience.—Reply, giving full particulars of age, experience, technical qualifications and salary required, to the Personnel Manager, Rolls-Royce, Ltd., Hillington, Glasgow, marking applications TE.1. [8944]

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BRITISH EUROPEAN AIRWAYS require a draughtsman-in-charge for the drawing office engaged on designing modifications, replacements, etc., for the Corporation's aircraft. Applicants should possess the Higher National Certificate in mechanical engineering, have served an apprenticeship, have at least 10 years' experience in an aircraft drawing office, be conversant with current design and A.R.B. requirements, and be capable of carrying out minor stressing work. Salary scale £780 p.a., rising to £1,000 p.a.—Written applications to Chief Personnel Officer, B.E.A., Keyline House, Ruislip, Middlesex. [8987]

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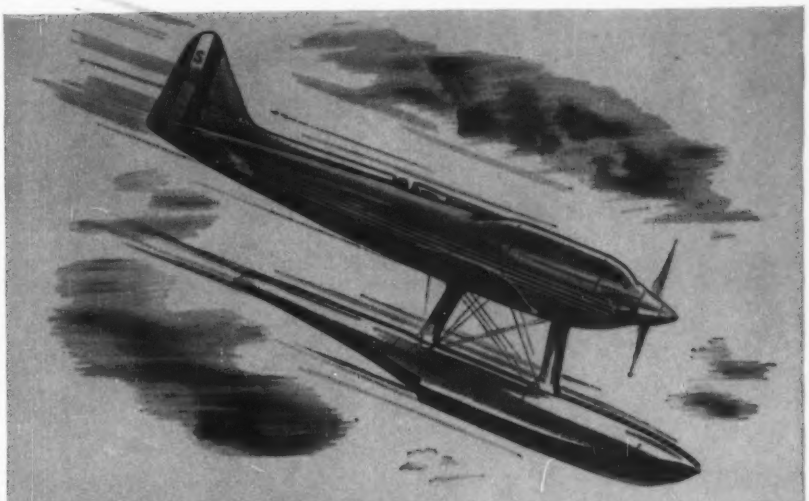

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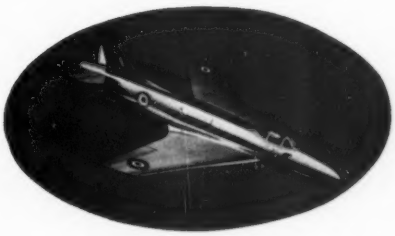

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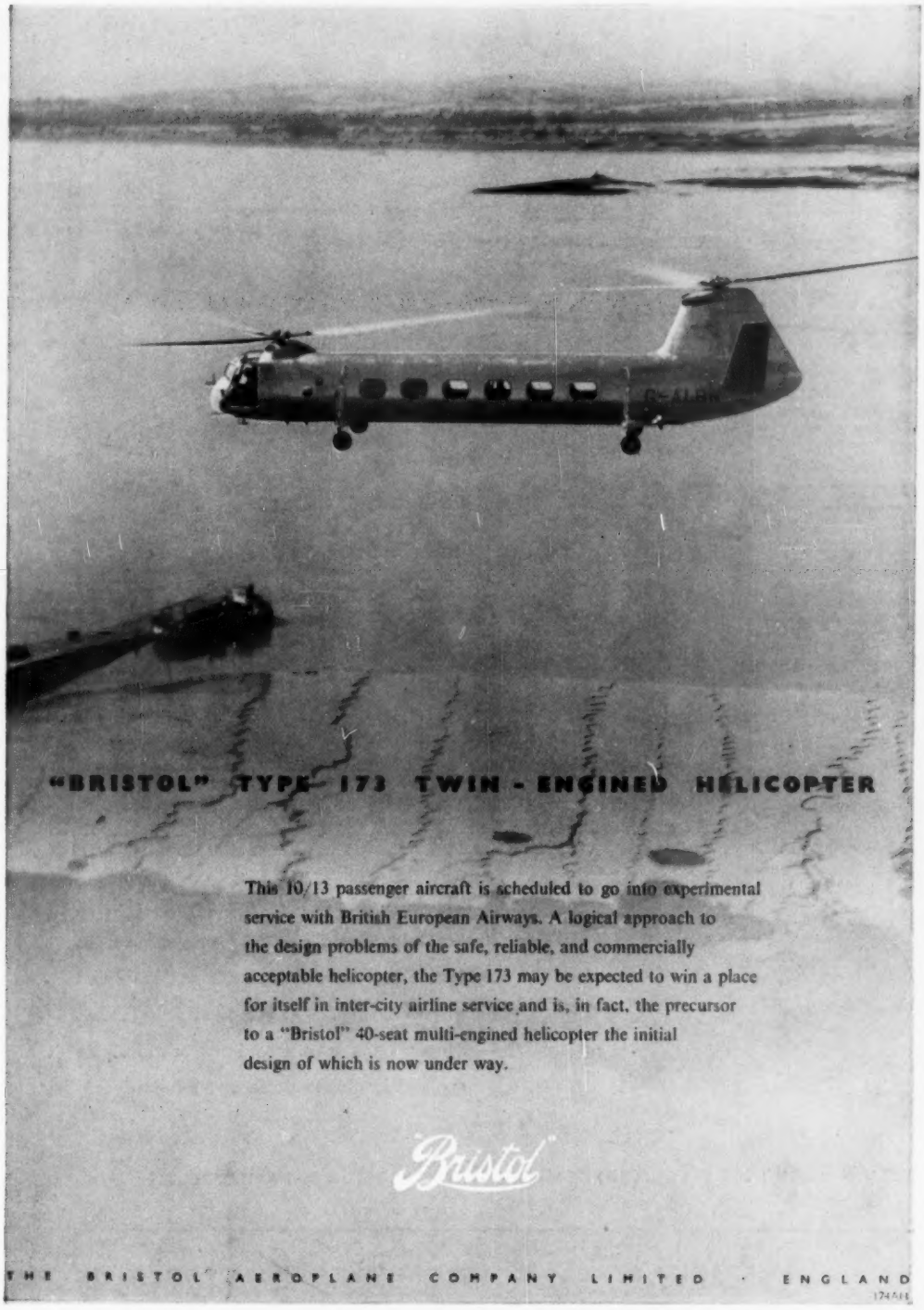

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